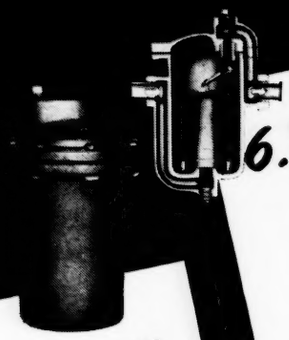
HEATING AND VENTILATING

INCLUDING AIR CONDITIONING — PIPING — REFRIGERATION — AIR [illegible]

9 reasons why...



1. **MORE ACTUAL CAPACITY PER DOLLAR** due to Armstrong's unique free floating lever mechanism.

2. **NO GAMBLE IN SELECTING TRAPS** because Armstrong capacity ratings are actual trap tests with hot condensate instead of slide rule calculations, cold water, or orifice tests.

3. **MINIMUM INSTALLATION COST.** Choice of horizontal or vertical traps reduces fittings and installation labor.

4. **BIG AIR VENTING CAPACITY.** Armstrong Traps are non airbinding. For quick heating use Armstrong BLAST Traps. Auxiliary air reliefs seldom needed.

5. **STRAINERS SELDOM REQUIRED.** Ordinary sediment and sludge are discharged along with condensate. You can guarantee 99 out of 100 Armstrong Trap installations without strainers.

6. **FOR ANY PRESSURE** from 1 to 1500 psi. Traps cannot be damaged by high pressure. Low pressure traps have mechanisms identical in design, material and workmanship with those used in forged steel traps for high temperature, high pressure service.

7. **FOR ANY VACUUM.** Armstrong's welded, heat-treated chrome steel valve parts do not leak steam and will last for years.

8. **ELIMINATE CALL BACKS.** Very seldom does an Armstrong Trap require servicing by the contractor. No adjustments, and no close clearances to require breaking in.

9. **UNQUALIFIED GUARANTEE.** Not for one year, not for two years, but for life are Armstrong Traps guaranteed against defects in workmanship or material.

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TWO VALUABLE HANDBOOKS

1. The Steam Trap Book — 36 pages of data on selection, installation and maintenance of Armstrong Steam Traps for ALL services.

2. "How To Select Steam Traps for Draining Unit Heaters" — 8 pages of data including BTU capacities of unit heaters made by 24 different manufacturers, how to select traps for each, conversion tables, installation diagrams and other information not available from ANY other single source. Anyone is welcome to a copy of both books. A post card request will do.

ARMSTRONG MACHINE WORKS, 846 Maple St., Three Rivers, Mich.

ARMSTRONG — STEAM TRAPS

Over a Million in Use...For Power...Process...Heating

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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The contents of HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and by Engineering Index.

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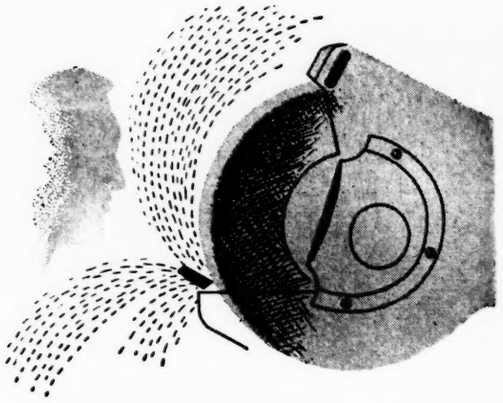
PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

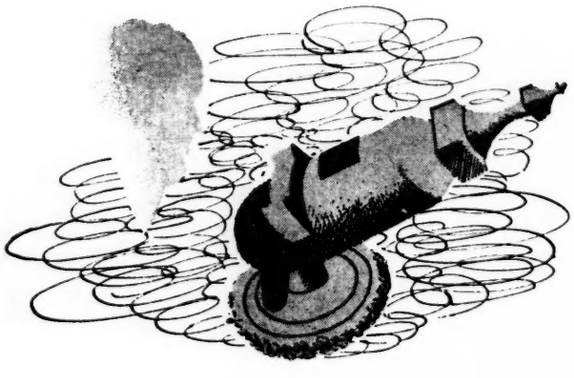
THIS MONTH'S COVER

Like many other film manufacturing operations, the slitting of large rolls into 35-mm strips for motion picture use is done in air conditioned dark rooms, supplied with filtered air accurately controlled with respect to relative humidity and temperature. See page 66. Photograph, courtesy Eastman Kodak Co.

they're strong for standardization



Electrical Engineer, machine tool company, says: "I think designers will save time in the long run if they decide, at the start of a job, to use standard motors. We'll eliminate exhaustive engineering tests we used to make on fractionals. With horsepower, service factor, breakdown torque, and starting current all rated on a clear-cut, uniform basis we'll know *in advance* that the motor will do the job."



Chief engineer, portable tool plant, says: "I simplify design when I specify series-motor parts with NEMA standard dimensions for our portable tools. By designing tool housings to take parts conforming to these standards, I simplify case construction. obtain interchangeable motor design, and lower overall costs."

Vice-President, washing machine company, says: "The use of *standard* washing machine motors helps our dealers to give dependable service. With standard motors, the service man can take full advantage of the motor manufacturer's motor-exchange and repair-service plans—take the headaches, and delays, out of motor repairs or replacement. He can be sure that the motor he puts back on the job will perform as it should."

Washington News

LORING F. OVERMAN

OF the thousand-and-one projects concerning which Washington thinking exerts more or less pressure upon business, it was difficult during the closing week of September to single out any certain few as being of exclusive concern to heating, ventilating, and air conditioning practitioners.

Russia's A-Bomb

News of Russia's atomic achievements captured the Washington headlines, of course, with many things of interest to all business and professional people implied in the fine print. Would the sharing of the atomic secret result in more war scares, or less? Would it mean a stepping up of armament programs, or would the ending of U. S. monopoly in the atom bomb field result in a stalemate which could result in cutbacks? Would it mean that there would be some agreement to outlaw atomic warfare, or should American cities and industries make immediate plans to go underground?

Each of these alternatives—and many more like them—involve a new kind of thinking on the part of those who engineer heating, ventilating, and air conditioning installations. As the month ended, however, Washington gave no hint as to whether to dust off old blueprints for proposed war-making improvements, or to turn to the drawing boards for entirely new patterns of dispersed living, working, manufacturing, and defense.

Optimism

In general, the tendency was to take the more optimistic view—one holding that when opponents square off brandishing weapons of equal and terrible potency, someone is likely to speak up and say, "Wait a minute. Hitting each other with such clubs as these isn't going to be healthy for either of us." These optimists point to the fact that even Hitler—who wasn't too squeamish when concentration camps and mass murders were involved—did not resort to the outlawed gas warfare although he may have felt it could have postponed defeat.

Whether Stalinistic thinking can be similarly appraised is another matter. It is probably not too much to assume, however, that an opponent's pleasurable contemplation of the possible flattening of Manhattan, Washington, Detroit, Pittsburgh and certain other strategic targets might be considerably tempered by the knowledge that his own treasured cities were also within bombing range.

Less Remote

Considerably less remote than atomic attacks, it is to be hoped, were several other explosive situations in late September—threatened strikes in steel, coal, and the automobile industries. Steel and autos showed the greatest promise of early settlement, with John L. Lewis' United Mine Workers characteristically unpredictable. Settlement of the first two, however, would be rendered meaningless by a long deadlock in coal. Coal stockpiles, it was estimated in September, would dwindle in about 60 days, with industrial paralysis as the final result.

In industries maintaining standby conversion facilities, oil was being eyed as an alternate. Even in this field, however, lack of terminal storage facilities would limit the service which oil might render.

Regardless of the outcome of the strikes, it seems apparent that the President's steel fact-finding board—in denying steel workers a wage increase but approving the idea of negotiating pensions on an employer-pay-all basis—has tossed a new hot potato into the laps of every employer, large or small. Although the Board's recommendation was intended to apply specifically to the steel industry, and under a stated set of existing conditions, union leaders have pounced upon the employer-pays-all pension idea as applying to workers in all industries.

Nor will the idea be limited to unionized employees. Personnel practices existing in one field have a habit of setting the pattern for others. Prediction: Coming months will witness the birth and rapid development of a new profession—Pension Counsellor. Meanwhile, industry is beginning to wonder whether in trying to avoid the fourth round wage push, it may have jumped from the frying pan into the fire. Wages, it is observed, are flexible things which can move up or down with the times. Pension plans, on the other hand, remain more or less static.

Again, an important change in the American way of life is activated—not by vote, not by law, but by official inference.

Congress Restive

Washington is getting used to the idea of a year-round Congress. Adjournment dates, originally set for August, are now discussed in terms of Thanksgiving Day. Some think that if members of Congress get home for Christmas they will be lucky.

Of direct interest to HEATING AND VENTILATING readers is a Senate action on September 23, authorizing $100 million to finance the planning by states and local governments of a $3 billion backlog of local public work projects. A similar bill, approved by the House Public Works Committee, is being held up by the Rules Committee.

While not on scheduled "must" lists, noncontroversial legislation of this type has a habit of slipping onto the agenda. In the final rush to "do something" before adjournment, this measure could get through. House members returned from a month's vacation on September 21 to find that the Senate had completed action on some appropriations, arms aid for Europe, reciprocal trade agreements, and minimum wage legislation.

ECONOMICAL-

USE-

Mastrol

DEPENDABLE, LOW MAINTENANCE COST SYSTEM of Pneumatic Temperature Control FOR SCHOOLS • HOSPITALS • COMMERCIAL, INDUSTRIAL AND APARTMENT BUILDINGS

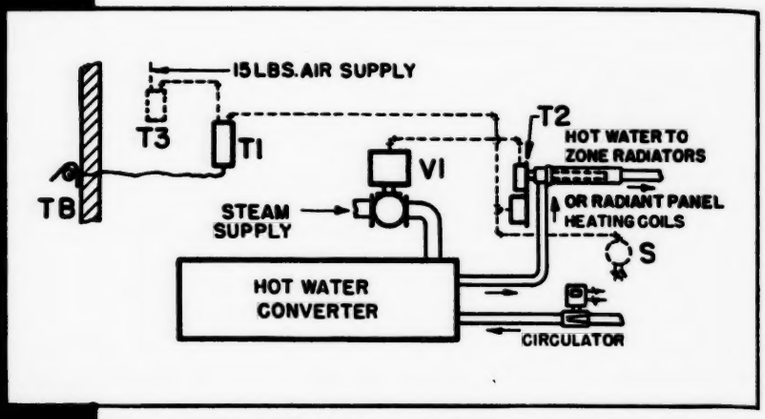
WITH a Powers MASTROL System of control, comfortable indoor temperatures can be obtained at a low initial cost. Fuel savings alone resulting from elimination of OVER-heating pay back a large return on a relatively small investment.

HOW IT WORKS—The Powers MASTROL system consists of two controllers. The outdoor instrument is the Master control and the indoor hot water controller is the Sub-Master regulator. The master control, conveniently located inside the building, has a thermal system consisting of armored flexible tubing and a sensitive bulb placed on an outside wall. The master control quickly responds to changes in outdoor temperature and pneumatically resets the control point of the sub-master regulator which varies the hot water temperature in direct relation to the outdoor temperature.

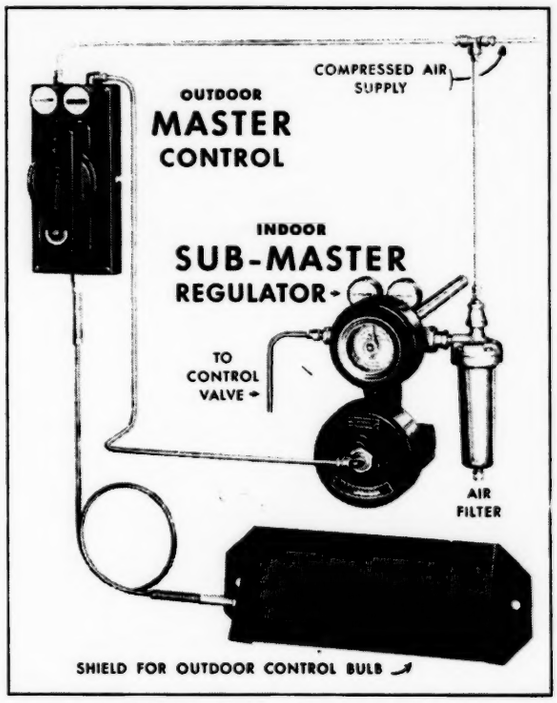
Users report "Very Low Maintenance Cost and Dependable Operation". When you want these advantages in a control system for forced hot water heating contact our nearest office or write 2718 Greenview Ave., Chicago 14, Ill.

MA

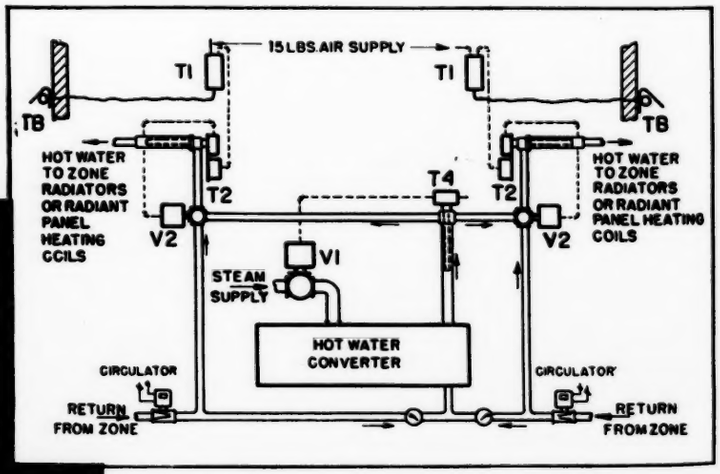
POWERS



Above, POWERS MASTROL System Controlling Hot Water Supply for Single Zone with Pilot Room Thermostat. TB-Outdoor thermal bulb and shield. T1-Master control, T2-Sub-master regulator. T3-Pilot thermostat 68°F. for quick warm up (optional). V1-Diaphragm control valve for steam. S-Switch to automatically stop circulator when outdoor temperature is above 60°F., (optional).



Powers MASTROL Control System — One of several combinations of Powers Master-Sub-Master controls for Forced Hot Water Heating Systems.



MASTROL System Controlling Hot Water for Multiple Zones Using 3-Way Water Mixing Valves—TB-Outdoor thermal bulb and shield. T1-Master control. T2-Submaster regulator. T4-Regulator for Maximum hot water control. V1-Diaphragm Control Valve for steam. V2-Three-way water mixing valve.

Previously passed by the House, final action awaits joint House-Senate conference compromises.

Considered inactive for the balance of the current session is a proposal to extend the Economic Stability Act of 1949, under which voluntary steel allocation programs have been conducted.

Also considered inactive are proposals to amend the Taft-Hartley Act, to amend the National Labor Relations Act to legalize hiring halls, to amend the Social Security Act, to investigate lobbying, and to amend the Walsh-Healy Act. Few other matters of direct interest to HEATING AND VENTILATING readers remain before Congress, most of them being concerned with proposed raises in pay for the military, postal employees, and executive department heads. Farm price supports are also scheduled for consideration.

Housing Market Forecast

If a just-completed projection of 3,500 interviews can be accepted, there will be a market for approximately 7,000,000 homes in the United States between 1949-53. The estimate, based on a survey conducted by the University of Michigan's social research center, was announced in Washington by the Federal Reserve Board. The board said, "Even allowing for excessive optimism on the part of consumers, their present plans, as indicated to the university pollsters, show there is considerable underlying strength in the housing market in the years immediately ahead. The Board announcement appends the proviso that times stay good and prices must not be too high.

The poll-takers concentrated on families, other groups that pool their funds together, and independent indivdiuals, making no allowance for new families that will be formed during the five-year period. The estimate does not include people living on farms.

Clearance Head Named

Although still awaiting appropriations to carry out the public housing and slum clearance program authorized by Congress in the Housing Act of 1949, the Housing and Home Finance Agency is proceeding with plans to recruit a staff and go ahead. On September 15, HHFA Administrator Raymond M. Foley named Nathaniel S. Keith as director of the new slum clearance and urban redevelopment program.

In this new position, Mr. Keith will be responsible, under the Administrator, for carrying out a program providing for one billion dollars in loans and half a billion in grants to communities throughout the country for acquiring, clearing, and preparing slum and blighted areas for redevelopment. This slum clearance phase of the program is separate from that of public housing, which is administered by the Public Housing Administration, an HHFA constituent.

Mr. Keith has served in the housing agencies of the Federal government in various capacities since 1940, and prior to that was a business and financial writer. He had been special assistant to the HHFA Administrator for the past two years.

While awaiting the go-ahead that will come with appropriations, Mr. Foley, Mr. Keith, and others of the staff are accepting numerous speaking engagements to explain the new Act to eligible communities and to units of the building industry.

"No Threat," Foley Insists

Speaking before the Mortgage Bankers Association on September 21, HHFA Administrator Foley called for the cooperation of the private building industry in helping to realize the housing goals set forth in the Housing Act of 1949.

Challenging the charge that public housing is a threat to private enterprise, he said, "Those of you who know the provisions of the Housing Act of 1949, its history and its background, know there is one chief basic reason why it is on the statute books of the nation. That reason is that decent housing—I don't mean shelter—has generally cost too much for the incomes of a great proportion of our people."

Mr. Foley said he could see no reason why the public housing program should raise the cost of producing housing, even temporarily.

"Considered on the over-all basis," he continued, "such claims appear to me to indicate a lack of confidence in the ability of industry to integrate itself to big production. In other industries, large production is always regarded as a means of lowering unit costs."

Research Phase Stressed

Important as the low-rent housing and slum clearance programs are, Mr. Foley said, the research program is of equal importance. It is designed, he said, to help private enterprise provide better housing at lower cost.

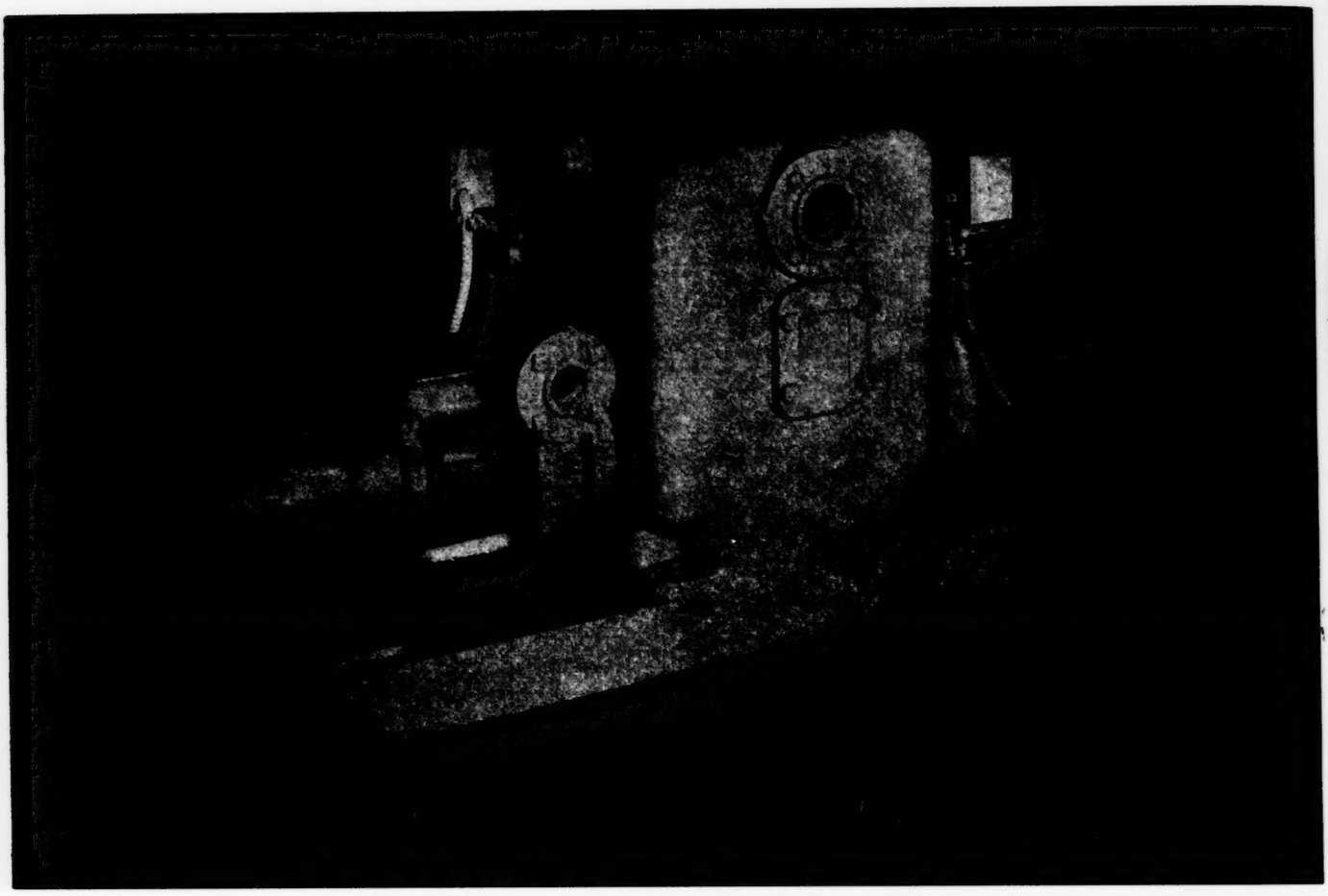
"The role of the Federal government in housing has been clearly stated by Congress," Mr. Foley concluded. "It will be to encourage and assist private enterprise by all proper means—to supplement private enterprise with public housing and other aids where they are necessary—but not to supplant private enterprise. It will be to recognize housing as a local community responsibility and to extend its direct financial aids through the communities."

Publications Issued

First fruits of the program, insofar as planners are concerned, are numerous publications. Among them is a 20-page illustrated booklet, "Modular Coordination," an HHFA publication available from the Superintendent of Documents, Government Printing Office, at 15 cents per copy. The new booklet tells, in words and drawings, what modular coordination is, how it works, and how it can help reduce housing costs. Two other booklets of a more technical nature are being prepared, one for use by architects and the other by construction contractors.

Another regular publication of the HHFA is a Technical Bulletin. No. 10, bearing a May-July dateline, discusses "Condensation Control in Dwelling Construction," and "Application of the Floor Furnace in the Heating of Small Homes." Copies are also available at GPO, at 20 cents. The booklet also lists publications available through the HHFA Division of Standardized Building Codes and Materials.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



JENNINGS CONDENSATION PUMPS

Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Handling a big bend of new steam conduit.

Looping a System for Steam Distribution

P. A. HYDE
Ohio Edison Co., Akron, Ohio

The Akron district steam system supplies 422 customers with more than 600 million pounds of live steam annually through an underground pipe distribution network of nearly ten miles. No exhaust or bled steam from electric generation is used in the system. Mr. Hyde shows how a new 16-inch loop line restored pressure at the extremities of the system.

GROWTH in steam demand from the fall of 1927, at which time the Ohio Edison Co.'s Akron district steam system was started, to the fall of 1946 reached a point where the capacity of the main feeder from the plant on Beech Street was being taxed severely.

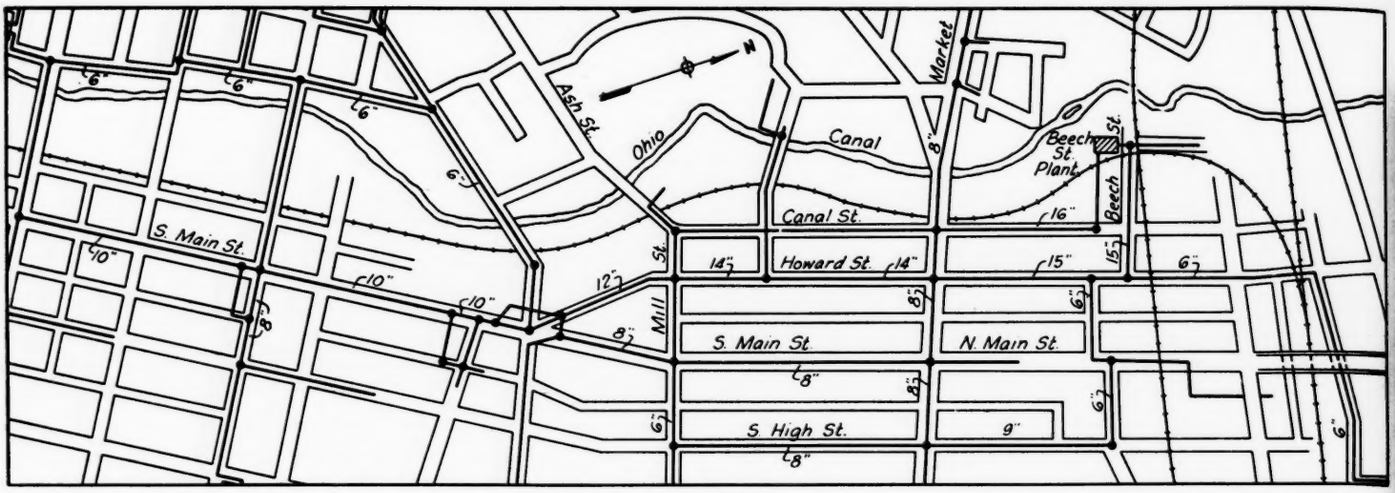
Since considerable trouble was experienced in maintaining pressure at the end of the line during peak demand, it was decided, in 1946, to construct a new feeder from the Beech Street plant to augment the existing 15-inch feeder and give additional assurance that end-of-line pressures would be maintained.

Accordingly a 12-inch line was constructed from the south end of the present boiler header to the plant wall and from there a 16-inch feeder tying into the 8-inch line at Market and Canal Streets (see map). The 16-inch tie-line, approximately 800 ft long, leaves the Beech Street boiler plant, parallels the main 15-inch feeder, then veers sharply south into Canal Street, forming a loop in connection with the 8-inch feeder at West Market Street.

Another tie-line, completed in 1948, connects the newly installed 16-inch line by a 14-inch line on Canal to Mill Street with an 8-inch line at Mill and Ash Streets. Steam pipe diameters will range in reducing sizes from a 14-inch connection to the 16-inch line at Canal and Market to 6- and 8-inch lines at the extremities. The function of this line also is to loop the area to insure uninterrupted service in event of a pipe line break, or repacking of expansion joints in that section when required.

Several methods of construction were given consideration and it was finally decided to use prefabricated Ric-wiL insulated pipe units with Schedule 20 steel pipe encased in Hel-cor conduit. The insulation is made up of 2½ inches of Fiberglas.

The line is very shallow at some points and it was necessary to get as much insulation as possible and practical. Where previous pipe line construction in city streets, of necessity, was deep, the inherent strength of the corrugated iron conduit in many instances enabled installation of the tie-line under only two feet of cover. The entire construction is in earth and the



A portion of the Akron district steam system showing location of Beech Street plant and new 16-inch main.

contour of the ground lent itself quite readily to this type of construction. Expansion joints are the Yarway gun-packed type.

Due to the fact that high voltage underground cables are within five feet and run parallel to the new steam line for a distance of approximately 175 feet before the connection to the 8-inch line, it was decided to build a ventilating system between the steam and electric ducts to prevent a temperature rise in the cable system and resultant loss of capacity. The ventilator consists of three 4-inch conduit pipes laid parallel to the steam main and manifolded into an 8-inch conduit at each end. In this area there is a rise in grade of about 20 ft, so with the lower manifold connected to an air inlet pipe and the upper one to an exhaust pipe, a very fine flow of air is obtained by gravity. To date this arrangement has given very satisfactory service.

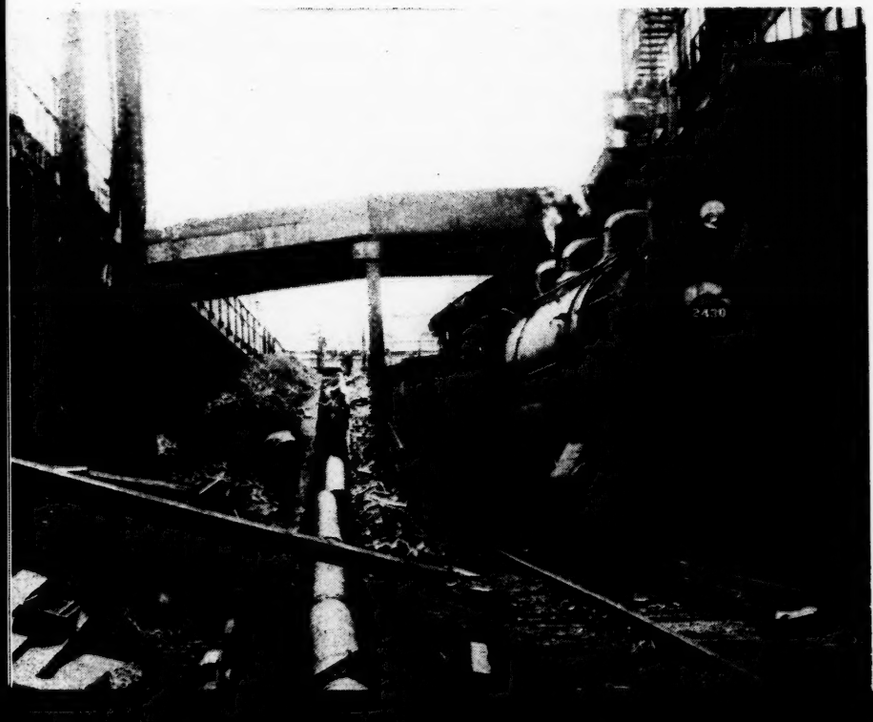
The operation of the line since it went into service the first part of December of 1946, has more than met all expectations. On the day the line actually was cut into service, approximately 185 lb pressure was being carried at the boiler header, feeding into the system at 135 lb per sq in. Difficulty was being experienced in maintaining a tail-end pressure of 115 lb. It was extremely interesting to watch the plant's operation, as the 16-inch line was cut into service. Within 24 hours, extremities of the Market Street line built up pressures much greater than required and the system had to be stabilized at the boiler plant. The boiler pressure gradually dropped until it was possible to get along with approximately 160 lb with the correct increase over original tail-end pressure.

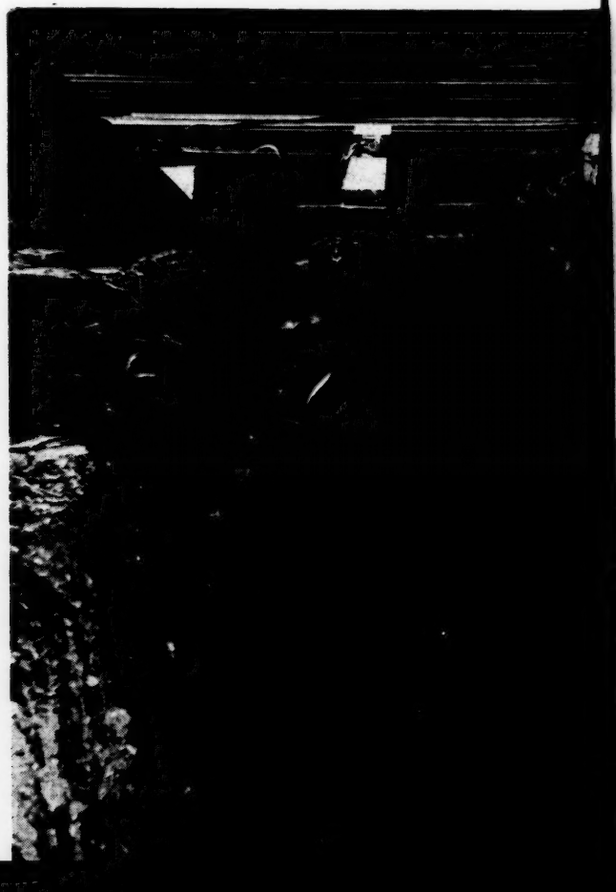
The method of operation is to use the 6-inch by-pass around the 12-inch gate valve. The line operates as a stablizing element for the 15-inch and 8-inch lines in Market Street. If more steam is required, the 12-inch gate valve is opened.

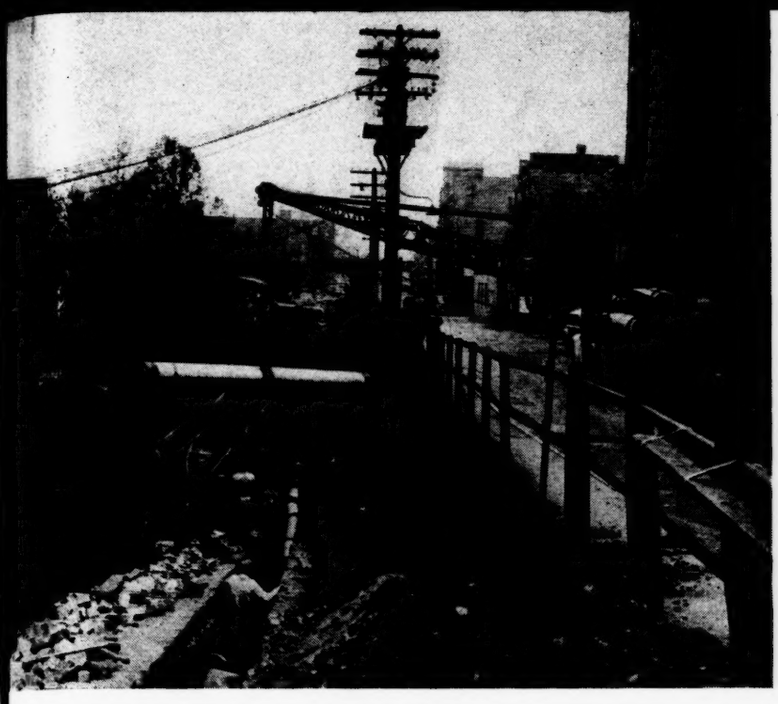
Rather exhaustive tests were run on the actual condensate loss in the line both by steam flowing through

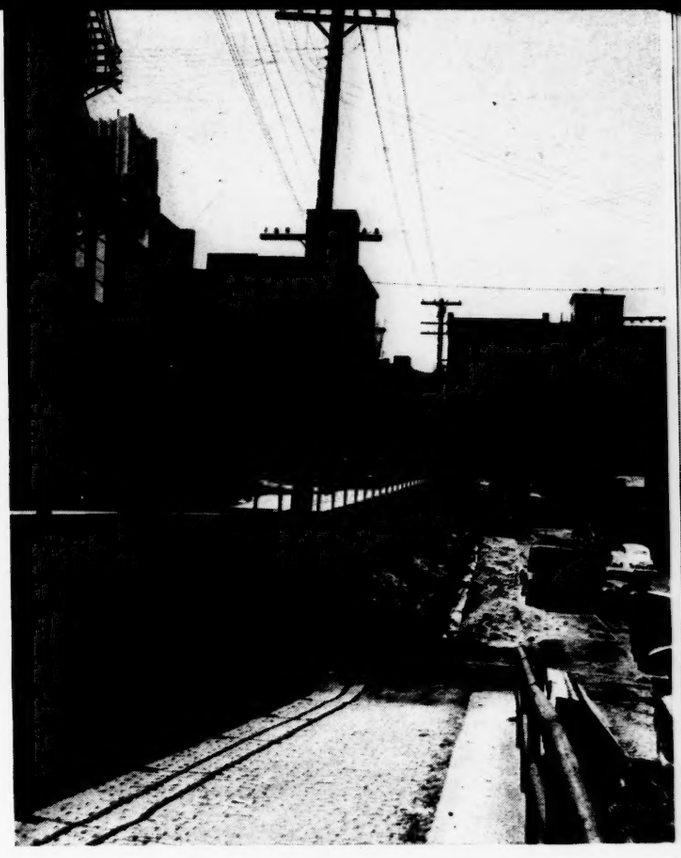
(Below) Sections of 16-inch line in place on Canal Street ready for welding. Prefabricated anchor is at lower edge of photograph.

(Right) Welding the 16-inch line underneath railroad tracks.









(Above) Lowering section of 16-inch line into trench ahead of construction.

(Right) Line placed ready for welding.

it and with the Market Street end shut-off. These losses showed that the operation of the new line was well within expectations with regard to estimated line losses.

Experience with this new line shows that it would not have been possible to carry the proper tail-end pressure during the extremely heavy loads in the early part of 1947 without this new feeder in service. It also was designed so that the present 15-inch line could be completely cut off this last summer for the installation of new expansion joints without shutting down the entire plant which was always necessary in the past.

We have now gone through a complete winter's operation with both 16-inch and 14-inch lines in service and this operation has more than met our expectations of improving service on the end of the system and flexibility of operation.

Nearing Absolute Zero

Armed with a completely new laboratory Westinghouse scientists are probing deeper into the mystery of how matter behaves at temperatures a fraction above absolute zero, which is —459.8F.

Dr. Aaron Wexler, head of low-temperature studies at the Westinghouse Research Laboratories, Pittsburgh, Pa., disclosed that a new cryogenics laboratory is producing custom-made temperatures all the way down to —458F. Using special techniques, the scientist can come within 0.1 degree of absolute zero.

"At such temperatures," Dr. Wexler explained, "the nature of matter undergoes radical changes and behaves in a most mysterious manner. For example, liquid helium flows uphill and the flow of electricity in a wire encounters no resistance at all. Although these facts have been known for years, scientists are striving to find out why this should happen."

Super-conductivity, Dr. Wexler added, may be of great significance to future power transmission. Only certain metals—thirteen of them thus far—are superconducting at sub-zero temperatures, he said. Among the most important of these are columbium, tantalum, vanadium, and their alloys, because they become resistance-free at temperatures that are relatively high. Pure columbium will conduct electricity without resistance at a temperature of 16 degrees above absolute zero, while its nitride will perform the same feat at 29 degrees above. A major aim of our research is to find metals or alloys that are super-conducting at higher and higher temperatures.

Dr. Wexler's laboratory takes helium gas in at one end and in a series of steps produces liquid helium at the other—with a temperature of —452F, about eight degrees above absolute zero. Additional methods bring this down to a mere fraction of a degree above absolute zero.

All through the process, electronic and mechanical controls take over. This enables the scientist to keep a constant check on the sub-zero temperature production. The helium gas is stored in tanks that line the ceiling of the laboratory, while the liquid helium is returned to its gaseous form after use and re-circulated into the storage tanks.

The scientist ranked low-temperature research on a par with nuclear physics as a factor in unearthing new information on the ultimate structure of matter.

Air Conditioning in Storing and Handling Motion Picture Film

J. M. CALHOUN
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The importance of air conditioning in the proper storage and handling of both motion picture raw stock and processed film is discussed, and some of the film troubles encountered in the absence of air conditioning are mentioned. Also included are data on laboratory workrooms and printing rooms, and the control of dirt in air conditioned laboratories.

MOTION picture film, like other photographic materials, is somewhat sensitive to the effects of both temperature and relative humidity, particularly the latter. The photographic and the physical properties of both the raw stock and the developed film may be adversely affected by improper temperature and humidity conditions during storage. Because the professional motion picture industry is highly mechanized, well designed, automatically controlled air conditioning in motion picture laboratories is of the utmost importance in maintaining the necessary technical quality and uniformity in the release print.

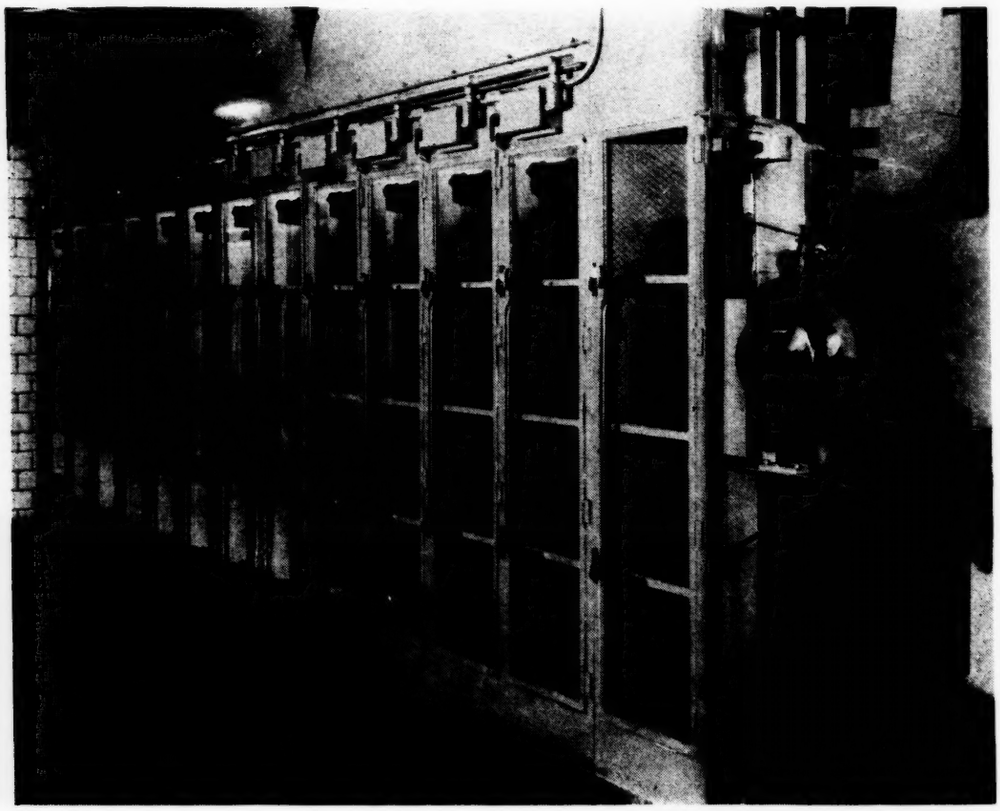
Hazard of Nitrate Film

The majority of professional 35-mm motion picture film is still on cellulose nitrate base which is a serious fire hazard. Although all 16-mm and 32-mm films are on safety base, 35-mm safety base film is steadily coming into more common use (1)*. However, as long as any nitrate film remains, all air conditioning facilities provided either for storage or laboratory space must be built in accordance with the general fire regulations governing nitrate film. These include fireproof building construction, vents to the outside, automatic sprinklers, limitations on the quantity of film, etc., as prescribed by the National Fire Protection Association (2), and by local fire and building codes, particularly those of Los Angeles and New York.

TABLE 1—MAXIMUM RECOMMENDED TEMPERATURES FOR FILM STORAGE

Type Film	Maximum Temperature, F	
	Storage Periods up to 1 Month	Storage Periods up to 6 Months
Black and white negative and sound films	65	50
Black and white positive films	75	65
Color films*	65	50

*Some color films may require lower temperatures, even for short storage periods, and special products or circumstances may warrant special conditions.



Drying cabinets of a 35-mm motion picture film processing machine require a supply of carefully controlled conditioned and filtered air.

*Numbers in parentheses indicate references listed at the end of the article.

Air conditioning itself represents an added hazard where nitrate film is present, because in the event of a fire, additional air may be supplied to the conflagration by the conditioning system, and the fumes from burning nitrate film, which are extremely poisonous, may be circulated throughout the building. For this reason air conditioning ducts must be equipped with Underwriters' approved automatic fire control dampers.

The same safety regulations apply to the storage and handling of nitrate raw stock and developed nitrate film.

Storage of Raw Stock

Virtually all photosensitive materials deteriorate with age. There may be a loss in sensitivity, a loss in contrast, or a growth in fog level, or all three. In the case of color films one color sensitive layer may lose speed at a different rate than another under adverse conditions and thus upset the color balance of the material. The rate of this deterioration is increased by both heat and moisture. Effects of moisture on motion picture raw stock are largely eliminated by the sealed can in which the film is packaged, *up to the time this seal is broken.* However, the film manufacturer has no control over the temperature to which his product is subjected.

In the case of motion picture negative film stock, it is desirable to maintain the high initial speed of the film as long as possible, and reduced storage temperatures are recommended, the actual temperature depending on the storage time anticipated. Reduced storage temperatures are important for color films to maintain the proper color balance as well as sensitivity. In the case of motion picture positive stock, on the other hand, high uniformity from roll to roll is more important than preservation of the initial speed. For this reason it is more important for the positive to be stored at a constant temperature, uniform throughout the storage area, than that the temperature be especially low.

Maximum temperatures recommended for the storage of motion picture raw stock to maintain the highest quality are given in Table 1.

There is no harm in using lower temperatures than those recommended. In any event the film must be allowed to warm up above the dew point of the laboratory air before the can is unsealed, otherwise moisture condensation and spotting of the film may occur. Humidity control is of much less importance than

TABLE 2—AIR CONDITIONS FOR FILM STORAGE AND PROCESSES

Use	Temperature, F	Relative Humidity, %
Laboratory workrooms and printing rooms	70-75	60-70
Drying cabinets	85 max.	40-60
Storage		
Raw stock	50-75	.....
Safety film	70-80	40-50
Developed nitrate film	50 or less	40-50
Developed safety film	60-80	40-50

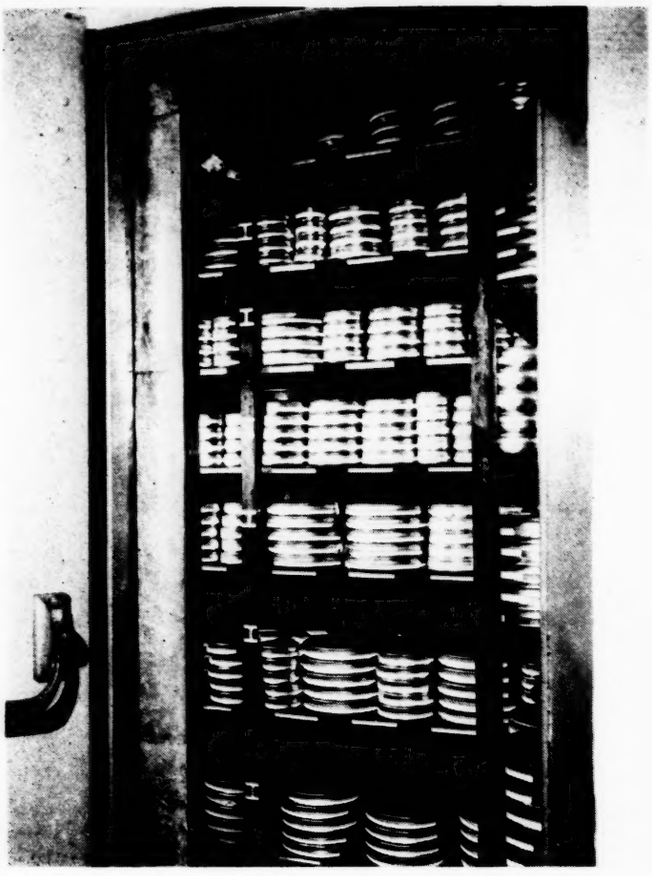
Section of a negative raw stock storage room. Until ready for shipment, motion picture negative raw stock is stored at 45F (55F in summer) with a relative humidity which should not be higher than 60%.

temperature control for the storage of raw stock in the original sealed cans, and *these should not be unsealed until ready for use.* However, very high storage relative humidities (over 60% to 70%) should be avoided because of possible damage to labels and cartons from moisture and mold, and to cans from rust. Low humidities are not harmful prior to breaking the package seal.

Conditioning of Laboratories

Once the seal on the film can is broken, the film will absorb or give off moisture, the amount depending on the relative humidity of the surrounding air regardless of the temperature, within practical limits. This rapidly affects the physical properties of the film and under adverse conditions can impair its behavior. Motion picture film is generally in equilibrium with air at approximately 50% to 60% R.H. when sealed in cans by the manufacturer. The exact value depends upon the particular product and is very carefully controlled. To minimize physical changes in the film it would be desirable to condition laboratories and workrooms at this same relative humidity and 70 to 75F. However, it is sometimes necessary to maintain the laboratory relative humidity at 60% to 70%, particularly in printing rooms, in order to prevent static markings on the film and the attraction or dirt caused by static (3). Film in unsealed containers should not be stored for any length of time in rooms conditioned at relative humidities over 60% because of the danger of mold.

If air conditioning is not employed in motion picture laboratories, low relative humidities may cause the film to become curly, shrunken, or buckled, as well as susceptible to static troubles, whereas very high humidities may make the film swollen, tacky, wavy, and more subject to photographic deterioration (4). Any of these effects may result in various practical difficul-



Processed motion picture negatives are stored at Kodak Park in air conditioned fire-resistant vaults. If used for nitrate film, vaults are equipped with an automatic fire door, automatic sprinklers and an explosion vent.

ties. For example, any appreciable change in the dimensions of the film may prevent proper registration in various printing processes. The importance of proper temperature and relative humidity control in motion picture laboratories cannot be over emphasized.

A supply of conditioned air is also necessary for the drying cabinets of motion picture processing machines. The actual temperatures and humidities employed for drying film vary among the different laboratories, but it is generally recommended that the temperature not exceed about 85F, and the relative humidity be held between 40% and 60%. The film should be neither under-dried nor over-dried. (5).

Dirt Control in Air Conditioned Laboratories

The raw stock as it comes in the can is quite clean, for it is made with extreme care under ideal conditions. Once the film is unpacked, it is in danger of becoming dirty. The sources of dirt are the outside air, which generally carries with it dirt in the form of dust and cinders. The personnel introduce dirt by reason of their activity or their clothing. Equipment can also introduce dirt in the form of metal grindings from moving parts, oil from bearings, or corrosion products from unsuitable materials of construction.

Air conditioning facilitates the elimination of dirt from laboratory air to the extent that the duct work and fans required for filtration are already present. At the same time air conditioning increases the necessity of eliminating dirt from the air because the more air movement which occurs, the greater is the chance of dirt lodging on the film.

Dirt can be removed from room air, sufficiently well, by means of ordinary commercial air filters (6). However, using the best filters lengthens the time between cleaning periods. Some types of electrostatic filters have proved advantageous in photographic practice. Filters made of bundles or mats of soft crepe paper or cotton pads give good results, and require less maintenance. No filter is perfectly efficient, and some smoke passes through it and agglomerates later. This agglomerated smoke deposits on walls or ducts and can be dislodged later by vibration or an accidental blow. Showers of such dirt are serious in the industry. They can be prevented in part by putting viscous filters on the ends of long runs of duct-work.

Filtration of air used in the drying cabinets should be as good as that used in the workrooms and preferably should be better, for dirt is caught more easily on wet film and removed with great difficulty, if at all. Ducts should be made smooth and solid and constructed so they can be easily and thoroughly cleaned.

The daily problem of inspecting working installations and controlling dirt caused by personnel is important, but the reader must be referred elsewhere for more detailed information (6, 7).

Storage of Developed Film

Storage of developed film differs from the storage of the raw stock because of several factors. The material is no longer photosensitive, it is seldom sealed against moisture, and much longer storage periods are generally involved. The conditions to be employed depend on the value of the records, the length of time they are to be stored, and whether they are on nitrate or safety base.

Relatively humidity is much more important than temperature in the storage of processed film. High humidities are particularly hazardous because of the danger of damage from mold (8), sticking, etc. A storage relative humidity of 60% is the maximum which should be permitted under any circumstances, regardless of temperature. Relative humidities below 25% should also be avoided because of increased film curl and the tendency of film to become somewhat brittle under such conditions. Temperatures above normal room temperature should be avoided in storing developed film because of the greater shrinkage which will result. Reduced temperatures are unnecessary for the storage of processed safety film, they are desirable in the case of nitrate film to retard chemical decomposition.

Nitrate films should be stored in unsealed cans in fireproof vaults constructed and equipped in accordance with the recommendations of the National Fire Protection Association (2). If the films are valuable, they should be stored according to the principle of unit isolation, so that each roll is insulated from its neighbors and connected directly with a flue to the outside air (9, 10, 11, 12). Then, in the event of spontaneous combustion, only one roll is lost. The storage space should be air conditioned at 50F or below and between 25% and 60% R.H., preferably

40% to 50% R.H. If storage for more than a few years is anticipated, it is recommended that all nitrate films be copied on safety base film and the originals destroyed to eliminate the fire hazard.

The storage of developed safety base films is much simpler, and approved storage vaults are much less expensive to construct. Nitrate films must never be stored in a safety film vault. A temperature of 60 to 80F and a relative humidity of 25% to 60%, preferably 40% to 50%, is satisfactory for the storage of safety film.

The long term preservation of valuable film records is an archival problem and requires special precautions. Only safety base films may be used for this purpose. The storage vault should be located and constructed as a six-hour fire resistive vault and protected against accidental water damage. Well controlled air conditioning at 60 to 80F, preferably 70F, and 40% to 50% R.H. is more important than in the case of short term storage. The air should be filtered to remove dirt and, in contaminated areas, cleansed of acidic gases. More detailed information on archival storage may be readily found in the literature (13, 14, 15, 16).

Acknowledgment

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References

1. Fordyce, Charles R. Improved Safety Mction Picture Film Support, *J. Soc. Mot. Pict. Eng.*, Vol. 51, Oct. 1948, pp. 331-350.

2. Recommendations of the National Board of Fire Underwriters for the Storage and Handling of Nitrocellulose Motion Picture Film as recommended by the National Fire Protection Association, National Board of Fire Underwriters Pamphlet No. 40, July 1, 1939. Also *J. Soc. Mot. Pict. Eng.*, Vol. 34, March 1940, pp. 311-333.

3. "Motion Picture Laboratory Practice and Characteristics of Eastman Motion Picture Film," Eastman Kodak Company, Rochester, N. Y., 1936.

4. Calhoun, J. M. The Physical Properties and Dimensional Behavior of Motion Picture Film, *J. Soc. Mot. Pict. Eng.*, Vol. 43, Oct. 1944, pp. 227-266.

5. Talbot, R. H. Some Relationships Between the Physical Properties and the Behavior of Motion Picture Film, *J. Soc. Mot. Pict. Eng.*, Vol. 45, Sept. 1945, pp. 209-217.

6. Simmons, N. L., and Robertson, A. C. The Measurement and Control of Dirt in Motion Picture Processing Laboratories, *J. Soc. Mot. Pict. Eng.*, Vol. 46, March 1946, pp. 185-205.

7. Carnall, R. G. R. The Dust Problem in the Photographic Industry. Conference on dust in industry at Leeds University, September 28-30, 1948. Soc. of Chem. Ind., London.

8. Prevention and Removal of Fungus Growth on Processed Photographic Film, Eastman Kodak Company, May, 1949.

9. Crabtree, J. I., and Ives, C. E. The Storage of Valuable Motion Picture Film, *J. Soc. Mot. Pict. Eng.*, Vol. 15, Sept. 1930, pp. 289-305.

10. Bradley, J. G. Changing Aspects of the Film Storage Problem, *J. Soc. Mot. Pict. Eng.*, Vol. 30, March 1938, pp. 303-317.

11. Report of the Committee on Preservation of Film, *J. Soc. Mot. Pict. Eng.*, Vol. 35, Dec. 1940, pp. 584-606.

12. Bradley, J. G. Film Vaults: Construction and Use. *J. Soc. Mot. Pict. Eng.*, Vol. 53, Aug. 1949, pp. 193-206.

13. Protection of Records. Consolidated Reports of the Committee on Protection of Records of the National Fire Protection Association, 1923-1939. (Reprinted 1945.)

14. Scribner, B. W. Summary Report of Research at the National Bureau of Standards on the Stability and Preservation of Records on Photographic Film, Nat. Bureau of Standards Misc. Publication M162, May 1939.

15. Saurwein, G. K. Air Conditioning for Protection, *Heating, Piping and Air Conditioning*, Vol. 13, May 1941, pp. 311-313.

16. Specifications for a Storage Vault for Archival Microfilm, Eastman Kodak Company mimeographed recommendations, Aug. 1946.

New Rubber Developed for Arctic Use

Discovery of a synthetic rubber polymer that will bounce instead of shatter at 75F below zero was announced by The Firestone Tire and Rubber Company.

"The amazing resiliency of this new Arctic rubber may enable engineers to solve innumerable problems in the operation of machinery, motor vehicles and aircraft at sub-zero Arctic temperatures," according to Raymond C. Firestone, vice-president in charge of research and development of the Firestone company.

Rubber tires, hose, gaskets and belting in the past have frozen as hard as rock at temperatures below minus 60F. In comparisons with GR-S and natural rubber, the new Arctic polymer has shown two outstanding advantages in tires tested under extreme subzero laboratory conditions. Tires don't stiffen so much that they develop permanent flat spots when parked and treads don't harden and chip out.

During far north military maneuvers in 1946, vehicles frequently were immobilized because the flattened part of the tire on the ground would take a permanent set when parked overnight. In the morning such tires would not roll until they were thawed out and made round again.

Test results indicate that tires made of the new Firestone Arctic polymer will be resilient enough to remain serviceable at temperatures as low as 75F below zero.

At temperatures of minus 61 to 63F, GR-S and natural tread rubbers become brittle, allowing pieces to chip out. Arctic polymer rubber treads in tests at temperatures below minus 75 degrees retain their resiliency and do not chip or break away.

Members of Firestone's research staff for the past two years have been conducting resiliency, elasticity, flex fatigue and highway mileage tests on various types of Arctic rubbers under contract for the U. S. Army's Ordnance Department. Additional research and test programs now are being conducted in collaboration with the Office of Rubber Reserve.

Mileage tests of Arctic rubber tires on the Firestone test fleet in Texas indicate the rate of wear of this cold weather tire will be very satisfactory under normal highway driving conditions.

Compensations affecting

Heat Transmission in a Flue or Tube

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Several compensating factors influence the heat transfer coefficient of a boiler tube in a domestic oil fired boiler. This article discusses these influencing factors and includes an illustrative example that demonstrates the use of data presented in calculating changes in the base rate heat transfer coefficient and reduction in flue gas temperature as the products of combustion travel through a segment of boiler tube.

ANY method of calculating the rate of heat transfer from a non-luminous gas to a tube or flue surface must, if it is to be at all accurate, include all the factors that affect such heat transfer. Although the effect of such factors is variable under all operating conditions, it is possible to determine their individual or collective effect upon the base rate heat transfer coefficient. The term "base rate heat transfer coefficient" as used here refers to the number of Btu transferred per square foot of tube or flue area, per degree temperature change, per hour, when the wall of the flue or tube is backed by water at 212F.

It can be seen from Table 1 that this base rate coefficient is 1.762 Btu. Changes in the value of any of the compensating factors affecting the rate of heat transfer as a result of actual operating conditions will be reflected in an increase or decrease in the value of the 1.762 base rate coefficient. This change in the base rate will naturally alter the total amount of heat transferred by the flue or tube and such changes are therefore of great importance to the boiler designer.

The method of calculating the base rate heat transfer coefficient as hereinafter described has been used primarily in the design of domestic oil fired boilers. It was necessary to start in such design problems from empirical bases of certain values from which to extend the system of calculation. The condition selected was one that would furnish a 10% volume of CO_2 in the dry products of combustion as a result of burning a representative No. 2 fuel oil. This 10% CO_2 which furnishes a fixed volume and weight of the products of combustion under measurable operating conditions was chosen arbitrarily as it represents the normal accepted standard of good operation for domestic oil fired units.

While it is true that higher CO_2's can be adjusted for on domestic oil fired units, it is general experience that such high CO_2's cannot be maintained for any period of time due to the multitude of variable conditions that constantly affect oil fired equipment. The selection of this 10% operating CO_2 provides the primary base for the calculations in relation to the volume and weight of the products of combustion.

The base rate heat transfer coefficient ($h = 1.762$) refers to the number of Btu transferred per square foot of heat receiving surface per degree temperature difference, per hour, under the actual conditions of temperature, density, velocity, viscosity and specific heat conditions. This figure 1.762 was arrived at as a result of study of all available test data for the behavior, as far as heat transfer is concerned, of air at 213F. This coefficient is further based upon the temperature of boiling water at sea level, 212F. One of the simplest methods of attaining a uniform rate of heat transfer at a uniform temperature would be to immerse a tube or flue filled with air at 213F in boiling water at atmospheric pressure. At this point it would be known that the uniform outside temperature of the tube would be 212F.

As can be seen, this furnishes a convenient empirical base, and from these temperature conditions of the two fluids was calculated the 1.762 Btu rate of heat transfer. Table 1 presents the changes or compensations in this base rate coefficient for air in such manner that it is adapted to the rate that would exist for the representative flue gas under the specific conditions in the table.

Influence of Variable Factors

In order to properly calculate the rate of heat transfer per square unit of surface in the tube or flue, as well as the actual temperature reduction of the flue gas per unit of linear travel, not only is it necessary to provide empirical bases of operation. but it is also necessary to determine what are the variable factors that will affect such transfer and how any fluctuations in the value of these factors will increase or diminish the quantity of heat energy in transition. To put it simply, just how and to what extent do these variable factors affect the base rate coefficient.

These variable factors are the temperature, density, velocity, viscosity, specific heat at constant pressure, and the non-luminous radiation from the flue gases. The effect of each of these is important.

The temperature of the products of combustion furnishes us sensible evidence of the variations in the intensity with which the heat energy is stored in the flue gases, but it does not show the quantity of heat that will be directly transferred as Btu.

Density

Density, which varies inversely as the absolute

temperature at constant pressure, presents variations which can be expressed by the ratio

$$\frac{T_1}{T_2} = \frac{D_2}{D_1}$$

In which this equation T_1 and D_1 = initial absolute temperature and density conditions, respectively; T_2 and D_2 = final absolute temperature and density conditions, respectively.

This factor of density acts in reverse of that of temperature in its effect upon the rate of heat transfer. It is generally assumed that an increase in the absolute temperature of a gas will facilitate the rate of heat transfer. Density changes alter this accepted condition considerably. An increase in the absolute temperature of a gas at constant pressure will result in a corresponding decrease in its density, and a corresponding decrease, because of this density change, in the base rate heat transfer coefficient. This is demonstrated by the density compensation column in Table 1. While the absolute temperature reflects the intensity of the heat energy contained in the flue gas, the density reflects the total number of molecules available for such heat transfer. Therefore, any decrease in density under the operating conditions with which we are concerned will bring a corresponding decrease in the heat transfer rate. For this reason, density must be regarded as an important factor in calculating the rate of heat transfer at any given temperature.

Viscosity of Flue Gas

The next factor affecting the rate of heat transfer from the flue gases is that of viscosity. The viscosity figure shown in Table 1 is none other than the absolute viscosity of the flue gas at the given temperature. This viscosity is measured in centipoises. These viscosities, which are the measure of the internal molecular friction, establish the extent of turbulence in the tube or flue passage.

This internal molecular friction increases with the temperature of the flue gas, and as it increases it has a resultant effect of increasing the amount of heat being transferred. This is due to the fact that as the viscosity of the gas increases, the actual number of molecules coming in contact with the flue or tube surface will be increased. It is interesting to compare, for a given rise in temperature, the difference in effect upon the rate of heat transfer occasioned by the density change and the viscosity change. An increase in temperature will decrease the density of the gas and, thereby, decrease the molecules per given volume.

But the same increase in temperature that results in the decrease in density will increase the viscosity, so that more of the available number of molecules will come in contact with the surface of the flue or tube for any given velocity. This is due to the increased turbulence occasioned by the increase in viscosity resultant upon the increase in temperature. The total result of increased viscosity is the more effective transfer of the lesser amount of available energy as a result of the decrease in density.

This turbulence created by the increased viscosity does two things. It actually brings more of the available molecules in contact with the heat receiving surface and it also facilitates the exchange of heat by accelerating intra-action between the molecules. Thus, as the viscosity increases for any given rate of heat transfer, there will be a corresponding compensation or increase in that rate of heat transfer directly proportional to that increase in the viscosity.

Velocity and Specific Heat

The next factor that affects the rate of heat transfer is velocity. Velocity, as measured in the flow of flue gases in feet per minute, effects a compensating increase in the base rate of heat transfer, as expressed by the figure 0.66 for any doubling of the velocity. The velocity compensation column in Table 1 demonstrates this.

The next factor that has to be considered that affects the rate of heat transfer is the specific heat at constant pressure. This figure, which shows the required amount of Btu to raise one pound of flue gas at a specific temperature and pressure, 1F, has a decided effect upon the rate of heat transferred. Thus the stored molecular energy for each degree rise in temperature of the gas at a constant pressure will become greater, and the discharge of this energy to a heat receiving surface because of this increased energy storage will be correspondingly greater. The higher the temperature of a flue gas at constant pressure, the higher will be the specific heat, and the base rate of heat transfer will be correspondingly increased. Therefore, if there is any increase in the specific heat, as the temperature increases at constant pressure, the base rate of heat transfer per square foot of heat receiving surface will be increased, as shown in Table 1.

Radiation

The final factor affecting the base rate of heat transfer is that of radiation from the non-luminous gases. This is expressed in the table as a percentage figure, which is a representative increase as expressed by that percentage of the original base rate coefficient, as corrected for other variable factors. The determinants of this percentage figure is the relative quantity of water vapor and carbon dioxide in the flue gases.

The compensation figures, as well as the base rate coefficient, refer only to a tube or flue where the periphery-area relationship is as 2 is to 1. This is representative of a 1.81 inch inside diameter tube. Any decrease or increase in this periphery-area ratio will result in a decrease or increase in the base rate coefficient. For instance, if the periphery-area relationship is as 1 is to 1, the base rate coefficient would be decreased by 0.33.

Method of Calculating

The utilization of this method for calculating changes in the base rate heat transfer coefficient and the reduction in temperature of the flue gas as it travels through any selected surface area segment of

TABLE 1—COMPENSATION TABLE FOR FACTORS AFFECTING THE BASE RATE OF HEAT TRANSFER AND THE INFLUENCE OF VELOCITY AND VISCOSITY COMPENSATION* ON HEAT TRANSFER

Temperature, F	Density Compensation, D_c	Velocity			Viscosity			Specific Heat		Radiation (Non-luminous) Compensation, Approximate
		Feet per Minute	Compensation, V_c	Adjusted Heat Transfer Coefficient	Centipoises	Compensation, F_c	Adjusted Heat Transfer Coefficient	At Constant Pressure	Compensation, C_{cp}	
200	1.0	312	1.0	1.762†	.0195	1.0	1.762†	.2403	1.0	.....
268.5	.95	343.2	1.075	1.893	.0210	1.077	1.896	.2413	1.007	.....
337	.90	374.4	1.095	1.929	.0227	1.162	2.047	.2423	1.010	.....
405.5	.85	405.6	1.138	2.005	.0242	1.240	2.185	.2433	1.014	.....
474	.80	436.8	1.185	2.087	.02506	1.284	2.262	.2443	1.019	.....
542.5	.75	468	1.250	2.202	.0268	1.375	2.422	.2453	1.022	1.02
611	.70	499.2	1.320	2.326	.0280	1.435	2.523	.2463	1.026	1.024
679.5	.65	530.4	1.395	2.458	.0297	1.522	2.681	.2473	1.030	1.032
748	.60	561.6	1.490	2.624	.0308	1.580	2.783	.2483	1.035	1.040
816.5	.55	592.8	1.575	2.775	.0320	1.640	2.889	.2493	1.039	1.048
885	.50	624	1.667	2.937	.0330	1.692	2.981	.2503	1.044	1.056
1015.2	.475	686.4	1.790	3.153	.0352	1.805	3.180	.2521	1.050	1.063
1145.4	.45	748.8	1.825	3.216	.0372	1.910	3.364	.2538	1.056	1.071
1275.6	.425	811.2	1.890	3.330	.0390	2.00	3.524	.2556	1.063	1.080
1405.8	.400	873.6	1.975	3.480	.0410	2.10	3.700	.2573	1.071	1.087
1536	.375	936	2.082	3.668	.0427	2.190	3.859	.2591	1.078	1.093
1666.2	.350	998.4	2.200	3.876	.0435	2.230	3.929	.2609	1.085	1.099
1796.4	.325	1060.8	2.325	4.094	.0462	2.370	4.175	.2626	1.093	1.105
1926.6	.300	1123.2	2.490	4.387	.0480	2.460	4.334	.2644	1.101	1.111
2058.6	.275	1185.6	2.630	4.634	.0495	2.540	4.175	.2661	1.108	1.118
2186	.250	1248	2.778	4.895	.0517	2.650	4.669	.2679	1.116	1.125

*For No. 2 fuel oil burning with a 10% CO_2 by volume of the dry products of combustion. Fuel oil approximately 84% carbon, 13% hydrogen, 3% nitrogen, oxygen and sulfur.
†Base rate heat transfer coefficient, h = 1.762 at 212F. Periphery to area relationship of tube is 2:1.

the tube, involves the use of five algebraic equations. These are:

$$h_1 = hD_cV_cF_cC_{cp}R_c \text{ at } T_2 \text{ level} \quad (1)$$

$$P = \frac{A_c\ (60V)}{L} \quad (2)$$

$$T_r = \frac{h_1\ (T_2 - T_1)\ A_s}{PC_p} \quad (3)$$

$$T_3 = T_2 - T_r \quad (4)$$

$$h_2,h_3,h_4 = hD_cV_cF_cC_{cp}R_c \text{ at } T_3,T_4,T_5 \text{ temperature levels, respectively,} \quad (5)$$

in which:

A_c = Cross-sectional area of tube in square feet.
A_s = Surface area in square feet of selected segment of tube.
C_{cp} = Specific heat compensation value at constant pressure at flue gas temperature (from Table 1).
C_p = Specific heat of flue gas at constant pressure at flue gas temperature (from Table 1).
D_c = Density compensation value at flue gas temperature (from Table 1).
F_c = Viscosity compensation value at flue gas temperature (from Table 1).
h = Base rate heat transfer coefficient 1.762.
h_1 = Adjusted base rate heat transfer coefficient for temperature level T_2.
h_2 = Adjusted base rate heat transfer coefficient for temperature level T_3.
h_3 = Adjusted base rate heat transfer coefficient for temperature level T_4.
L = Specific volume of flue gas (cu ft per lb), at flue gas temperature.
P = Pounds of products of combustion (flue gas) per hour.
R_c = Non-luminous radiation compensation value at flue gas temperature (from Table 1).
T_1 = Temperature of surface of the flue or tube.
T_2 = Temperature of the flue gas entering tube or flue.
T_r = Temperature reduction of the flue gas for any selected surface area segment of tube or flue.
T_3,T_4,T_5 = Progressive adjusted temperatures of the flue gas after successive reductions T_r (see equation 4).
V_c = Velocity compensation value at that flue gas velocity (from Table 1).
V = Velocity in feet per minute of flue gas.

This method can be applied to the design problems involving a tubular boiler with the peripheral area relationship required to utilize the data as set down in Table 1. The inside diameter of the selected tube was 1.81 inches; the area 2.57 square inches and the circumference 5.68 square inches, for the example which follows.

It was calculated in designing the boiler that the flue gas would enter the tube at 1145F (T_2) with the water side of the tube being at 212F (T_1). Referring

to the successive equations given, the change in the base rate heat transfer coefficient as well as the reduction in the temperature of the flue gas in traveling over the selected segment of the tube could be calculated. The segment of the tube chosen was 12 inches long.

Applying equation 1, under these conditions, we find from the Table 1 that at 1145F, the compensation factors are as follows: $D_c = 0.45$; $V_c = 1.83$; $F_c = 1.91$; $C_{cp} = 1.056$; $R_c = 1.071$. Substituting in equation 1

$$h_1 = 1.762 \times 0.45 \times 1.83 \times 1.91 \times 1.056 \times 1.071$$

or $h_1 = 3.13$, the adjusted base rate heat transfer coefficient at T_2 level.

Equation 2 is now employed to solve for P, the pounds of products of combustion per hour. Substituting in equation 2, with $A_c = 0.0178$ we find

$$P = \frac{0.0178 \times 60 \times 749}{41.25}$$

or $P = 19.4$ pounds of flue gas per hour.

Substituting for P and the other terms of equation 3, the temperature reduction of the flue gas as it travels through the selected 12-inch segment of the tube is now calculated.

$$T_r = \frac{3.13 \quad (1145 - 212) \quad 0.473}{19.4 \times 0.254}$$

or $T_r = 280.1$F.

Equation 4 is now employed to find the new temperature level. Substituting we find:

$$T_3 = 1145 - 280.1 = 864.9.$$

At this new (adjusted) T_3 temperature level of the flue gas, the compensation factors are found from the Table 1 by interpolating for each factor. Thus, $D_c = 0.516$; $V_c = 1.64$; $F_c = 1.67$; $C_{cp} = 1.043$; $R_c = 1.04$. Substituting these values in equation 5, h_2 at the T_3 temperature level is solved for.

$$h_2 = 1.762 \times 0.516 \times 1.64 \times 1.67 \times 1.043 \times 1.04$$

or $h_2 = 2.71$, the adjusted base rate heat transfer coefficient at 864.9F.

Having now solved for the adjusted base rate heat transfer coefficient at the new temperature level, the process of calculation is now repeated. Practically, it is no longer necessary to solve for P in equation 2, as it is already known from the previous solution. The temperature reduction is computed by using equation 3, in which

$$T_r = \frac{2.71 \quad (864.9 - 212) \quad 0.473}{19.4 \times 0.250} = 172\text{F}.$$

Solving for T_4 in equation 4,

$$T_4 = 864.9 - 172 = 692.9\text{F}.$$

Returning to equation 5 and substituting the interpolated values found from Table 1 at the adjusted T_4 temperature level (692.9F), we find $D_c = 0.64$; $V_c = 1.41$; $F_c = 1.537$; $C_{cp} = 1.031$; $R_c = 1.03$; therefore

$$h_3 = 1.762 \times 0.64 \times 1.41 \times 1.537 \times 1.031 \times 1.03$$

or $h_3 = 2.59$ adjusted base rate heat transfer coefficient at 692.9F.

The base rate of heat transfer has now been adjusted for three temperature levels and the temperature reduction of the flue gas ascertained for two 12-inch segments of the tube. The calculations can continue for any number of segments that make up the length of the tube. As each new temperature level is reached, the specific compensation factors are employed, the total surface area under calculation meanwhile diminishing until the end of the tube is reached. At this point, the temperature of the gas leaving the boiler is established.

The application of this method of finding the heat transfer changes predetermined with a marked degree of accuracy both the reduction in temperature of the flue gas and the changes in the heat transfer rate. Test runs on a boiler designed with the assistance of this method of calculating showed but a few degrees difference between the actual and calculated temperatures of the products of combustion as they left the boiler and entered the breeching, while being operated at design conditions.

Control Guards Ventilation of Parkway Tunnel

An instrument to continuously sample air near entrances to the 2000-foot-long West Rock Tunnel along the Wilbur Cross Parkway, U. S. Route 1, at New Haven, Conn., will check concentrations of carbon monoxide gas and control operation of the tunnel's ventilating fans. The device, which can detect as little as one part of the deadly gas in a million parts of air, is manufactured by the Mine Safety Appliance Co., Pittsburgh, Pa.

When concentrations exceed a predetermined limit, the instrument activates ventilating fans that deliver fresh air into the tunnel at a rate sufficient to maintain safe conditions. A continuous record is maintained for CO concentrations that are present in the tunnel air.

There are individual detecting instruments for each of the two vehicular tubes. In addition, four less elaborate carbon monoxide ventilation controls have been provided, two located along each of the tunnels to detect any accumulation of exhaust gases during traffic stoppages or other unusual conditions. These instruments also are capable of actuating ventilating fans when carbon monoxide becomes excessive in the tunnel air.

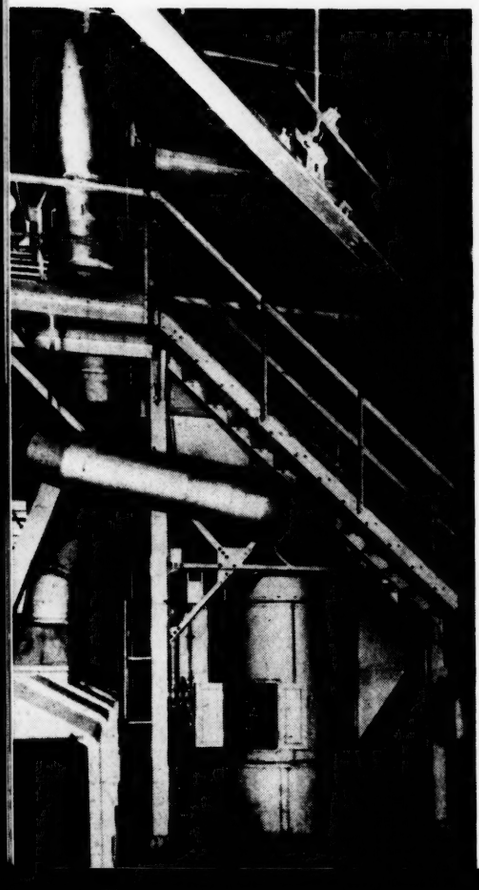
Conveyor runs completely around molding unit. Operator is setting flask over drag pattern.

Automatic Molding Machine

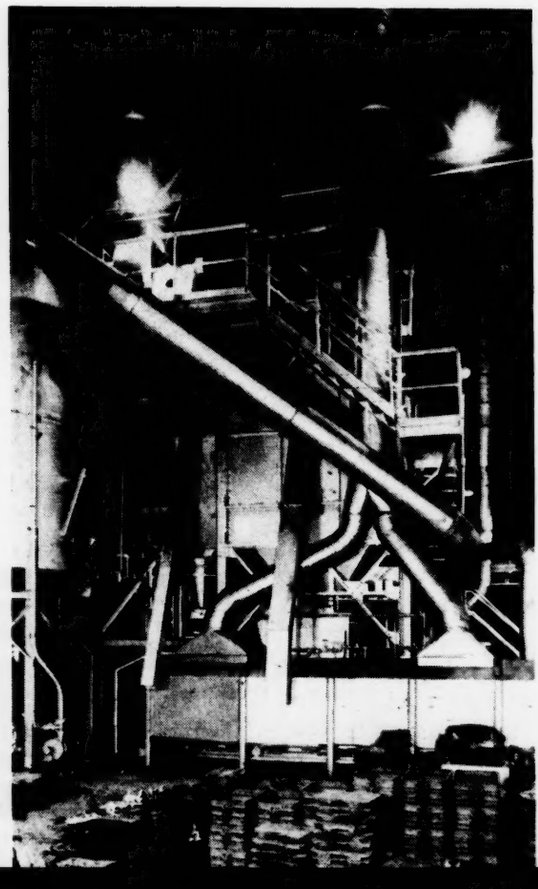
A self-contained molding machine performing all the functions and operations to produce molds, from introduction of the sand ingredients through completion of multiple molds stacked six high ready for pouring, is now in operation at the Cleveland, Ohio, plant of the Westinghouse Electric Corporation. Developed through the joint efforts of International Molding Machine Company, Lagrange Park, Illinois; Westinghouse; and other cooperating companies; the new machine is increasing the yield of high-quality castings at reduced cost and is believed to be the first completely automatic molding unit for mass production of castings by multiple molding methods.

All equipment is arranged in a synchronized oper-

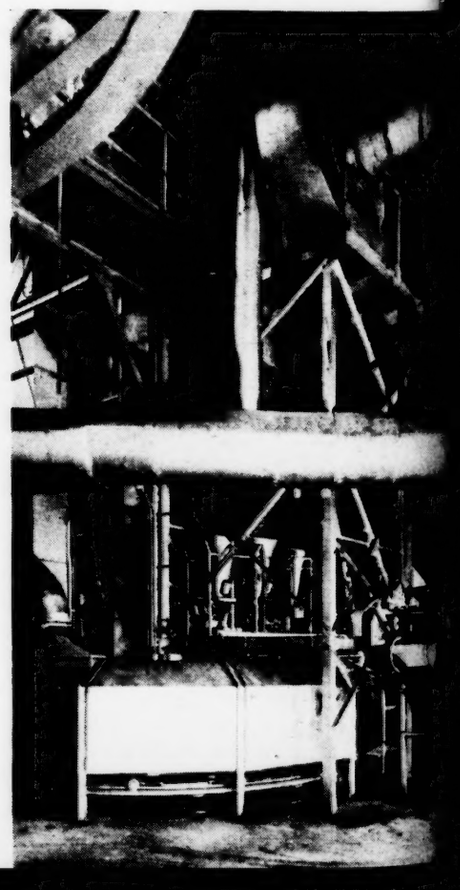
Sand muller and storage bin where sand from the automatic shakeout is worked over and stored for reuse.

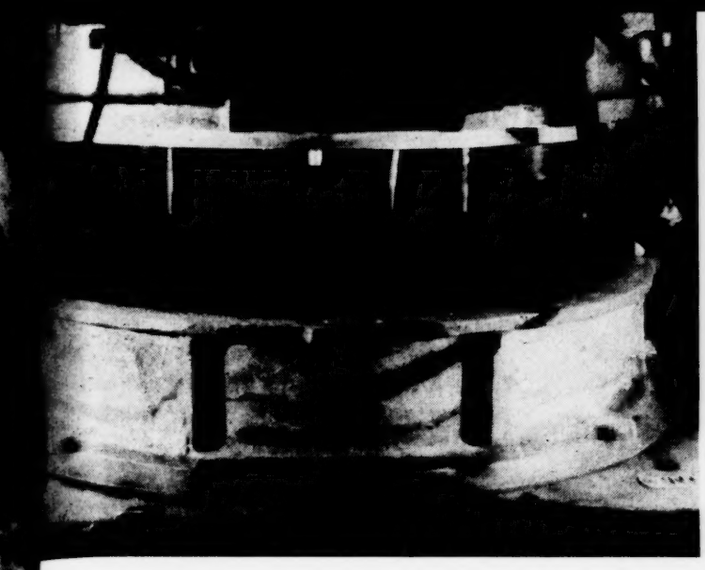


Sand from storage bin behind pipes in rear is blown into a flask in the first position on the assembly line. Stacked flasks travel through cooling hood in foreground.



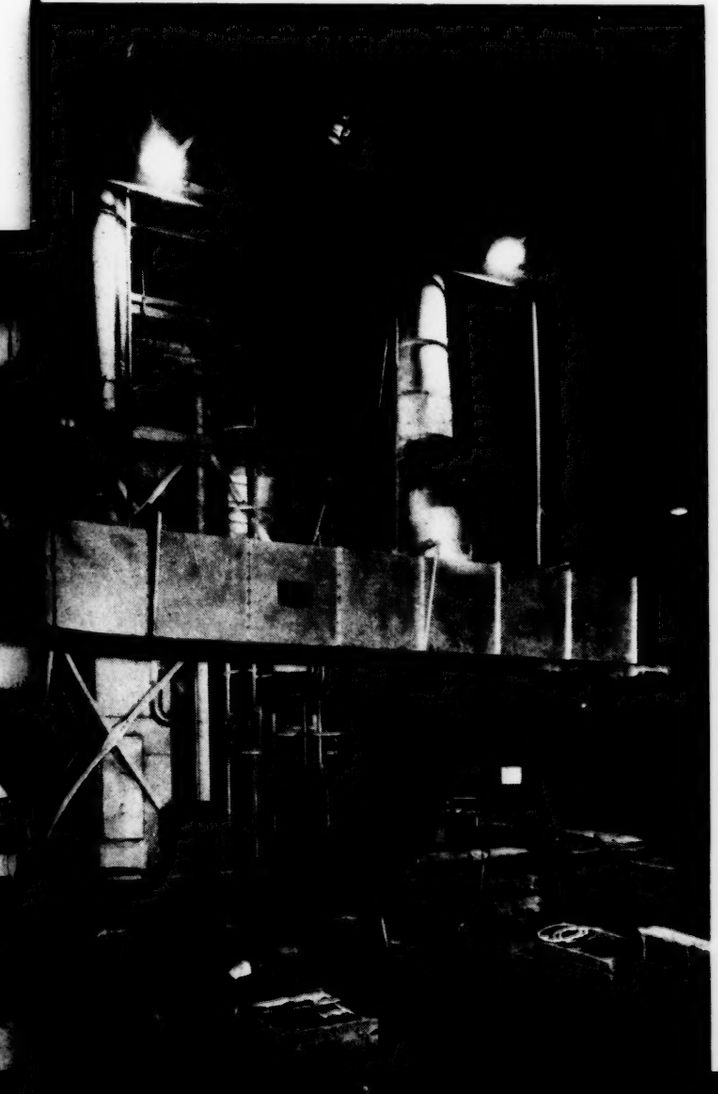
Sand hoppers can be seen in the center beyond the large pipe. Discharge end of the wet dust collector is to the right.





Flask, after pressing by head carrying cope pattern for five molds, is ready for drawing the drag or lower pattern and stacking on top of previously pressed flasks.

ating sequence actuated by air and hydraulic power under complete electrical timing and control. There are four principal work positions in the molding unit. Sand is blown into a flask at the first position to make a preform of the mold. In the second position, the sand in the flask is squeezed around a drag pattern in the bottom of the flask under pressure of 50 tons by a



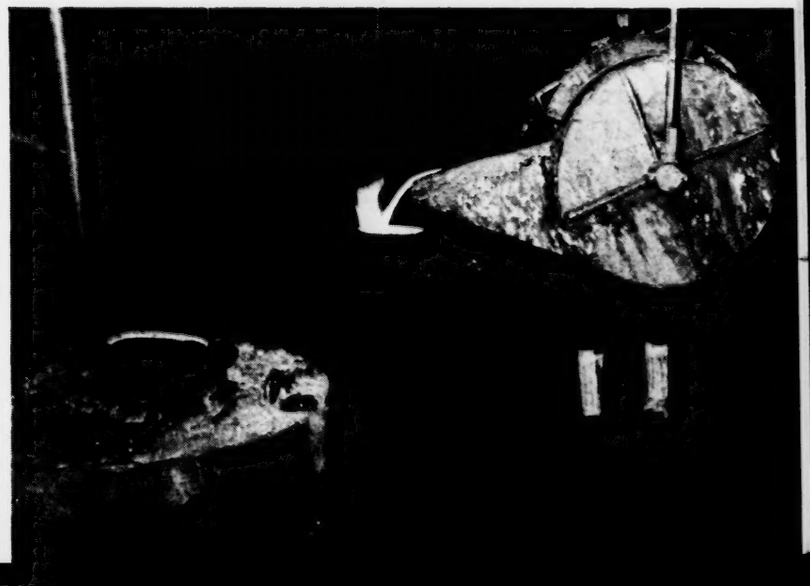
General view of automatic molding machine. Room housing electrical controls can be seen in the right background. Pouring position is at extreme right. Pour-off hood in foreground removes gases and fumes. Sand elevator and hopper can be seen behind hood.

Cores are set at the stacked position before being conveyed to the pouring platform.

head carrying a cope pattern. The drag pattern is removed in the third position and flasks are stacked six high in the fourth position to make up five complete molds in each stack.

Completed stacks then travel on a conveyor system by the pouring platform and cool as they continue around the back side of the machine. The flasks are shaken out in a machine near the first work position where they are available to start the circuit again.

Completed flasks containing molds proceed from stacked position to pouring position on a conveyor belt. Operator below is pouring a complete gate of castings.



Heating a Newspaper Plant

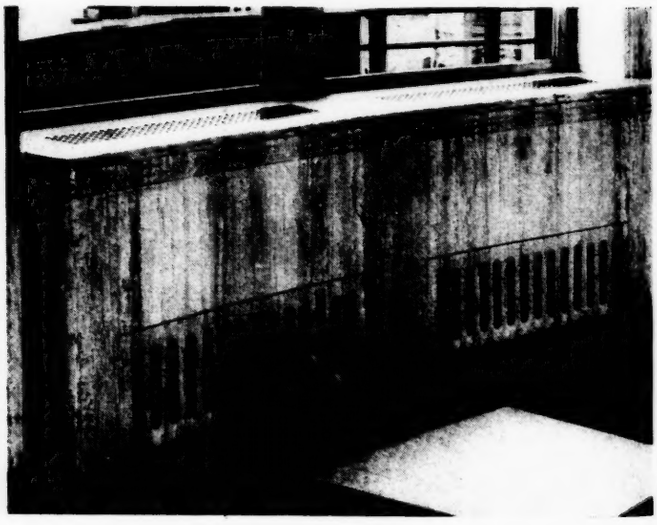
Three general types of space are involved in the heating of a newspaper plant; the printing shop, office space, and a public area. Here is one solution using a single heating system.

THE new building for the *Seattle Post-Intelligencer* posed special problems in heating which are increasingly typical of buildings designed for publishing operations. This building, like others of its kind, houses three general types of space, each with its own special heating requirements. These space types are:

(1) Pressrooms which are large, high, and well lighted. Heavy, intermittent heat gains from machinery are characteristic of this type of space. The *Post-Intelligencer* pressroom is about 40 ft high and is enclosed at both ends by glass. Close control of heat and humidity are especially desirable in areas where paper must be handled rapidly in single sheets and within close tolerances of measurement and printing register.

(2) Office spaces which must be held at comfort levels for continuous occupancy.

(3) Public areas where spaciousness, interior decoration, and intermittent traffic from outside are factors in heating system design. The *Post-Intelligencer* lobby is a large, high, circular room finished in marble with the provision that no exposed heating equipment should be used.



Marble-enclosed finned radiation for the lobby.

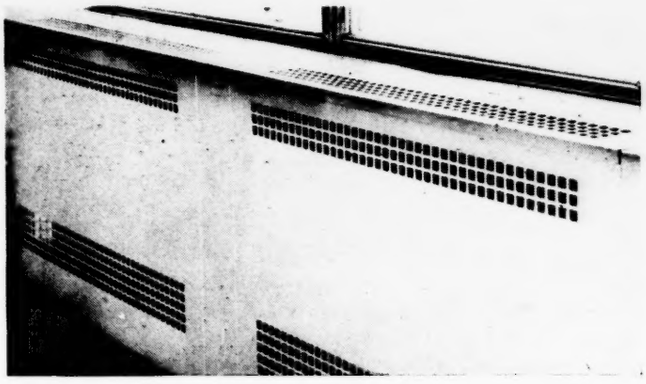
To design a single, flexible heating system to meet requirements of all three types of space, Lockwood Greene, Engineers, Inc., of New York, specified a Dunham vacuum steam system with finned pipe radiation.

In the pressroom, the problem of height and immense glass area was met by installing finned pipe at three levels (3, 15 and 20 ft) along the full length of the windows. With thermostatic control, a curtain of warm air is maintained between windows and working areas.

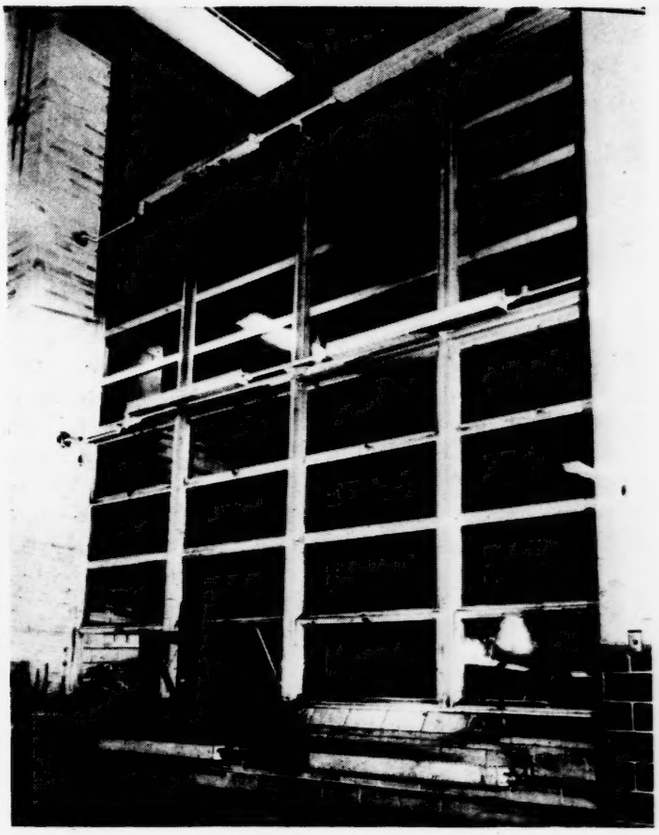
Office spaces are heated with finned pipe radiation enclosed in metal cabinets beneath window sills. Extension stems on the packless radiator valves permit valve handles to be accessible from outside the metal cabinets.

In the lobby, finned pipe radiation was installed behind marble slabs. The only visible evidence of a heating system in this area is the inlet through the marble at floor level and an outlet grille on the lobby window sills.

Basically, the principle behind heating the *Post-Intelligencer* building has been to provide a curtain of warm air rising, under closely controlled conditions, between extensive glass areas and working spaces.



Metal-enclosed radiation for office space.



Three levels of exposed finned radiation to curtain large glass areas with warm air in the printing plant.

The associate architect on the project was Henry Bittman, Seattle, Washington; general contractor was Howard S. Wright & Co., Inc., Seattle, Washington; plumbing and heating contractor was University Plumbing and Heating Co., also of Seattle.

Methods for Reducing Heat Gain

The sales engineer should always be on the alert for opportunities to reduce the heat gain of a structure and thus reduce both the initial cost of equipment required for air conditioning and the operating cost as well. He will find such thoughtfulness self-compensating in the confidence and goodwill which it brings him.

The use of insulating materials in walls which have a heavy heat gain is one of the most obvious methods of reducing heat gain. Such walls, ceilings, roofs, etc., are frequently discovered while making the heat gain calculation, and it is worthwhile to call them to the attention of the prospect. Of course, the use of insulation reduces winter heating costs as well as summer cooling costs.

The use of awnings, blinds or shades is an aid in the reduction of sun effect through windows. Attention should be called to the fact that shades, blinds, etc., are of no benefit unless they are drawn. The installation of air conditioning does not eliminate the necessity of attending these devices.

The spraying of water on roofs which are directly over the air conditioned spaces is a third method. This water may sometimes be taken from the water discharge circuits of the condensing units. If the water is spread on the roof in a thin sheet, then it may be assumed that those areas which are so covered have zero heat gain, either from conduction or sun effect.

Attic ventilation is another means of effecting reductions in the heat gain through roofs. In many cases, unventilated attics situated beneath roofs which are exposed to the full intensity of the sun may rise to temperatures as high as 130 or 140F. Since the outdoor air is seldom hotter than 110F, even in the most torrid localities, it has the capacity to remove heat from such attics, provided it is forced through the attic by a suitable fan or blower. The fan should be able to provide in the neighborhood of 30 complete air changes per hour in the attic space. Under such conditions the average air temperature in the attic space will usually be from 5 to 10F warmer than outdoors during the middle of the afternoon, when the sun effect is greatest. There are times, of course, when attic insulation may be more valuable than attic ventilation.—*C. W. Brown, Application Engineering Division, Air Conditioning Dept., General Electric Co.*

Some Disadvantages of Lifts in Condensate Return Lines

T. W. REYNOLDS
Chief, Air Conditioning Division, Abbott, Merkt & Co., New York

THE writer has yet to find a lift in a vacuum return line that could not be avoided by designing around it, or by using additional pumps rather than lifts. Lifts are used and abused, and many pump manufacturers would rather not sell a pump where lifts are used, finding it better to forego the sale than to have the usual difficulties attributed erroneously to the pump.

How the Lift Works

Lifts have been defined as special devices used in pairs at points in vacuum heating systems where condensation is to be lifted to a higher level (see Fig. 1). The condensation is lifted vertically to a higher level in "slugs" on the air-lift principle; the slugs being obtained by the use of a comparatively small diameter vertical return with its lower end submerged in the well below the level of the horizontal return which it drains (see Fig. 2). The lower lift fitting allows the condensation to accumulate in the well below the inlet connection until it seals the vertical passage, thus causing a slight reduction of the vacuum on the inlet side and forcing the water from the well through the vertical lift pipe to the higher level. The upper lift fitting allows the condensation to flow into the horizontal return without falling back into the lifting line.

Some Difficulties

With this explanation, we may now consider some of the difficulties encountered with lifts. For example, the average setting at the pump for vacuum regulation is from 4 inches to 8 inches, the upper limit being maintained only by virtue of a tight job. Lifts, however, call for a high terminal vacuum, so that pumps run much of the time, even when there are only an average number of leaks. In a period of, say, 25 years, three pumps will be worn out operating with lifts, but one pump will last this period without lifts, other conditions being equal.

Lifts prevent a steady or uniform flow of condensate to the pump, because the pump after starting must run for some time before the vacuum is sufficient to work the first lift, the others awaiting their turn. If lifts are used, they should be used 100% throughout, and not with some part of the job returning by gravity. If possible, all lifts should be of equal height and, if not possible, then the highest lift should preferably be located the first from the pump.

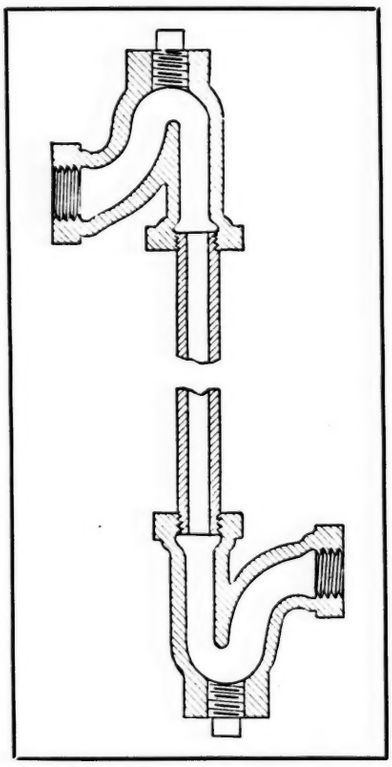


Fig. 1. Section of lift fitting.

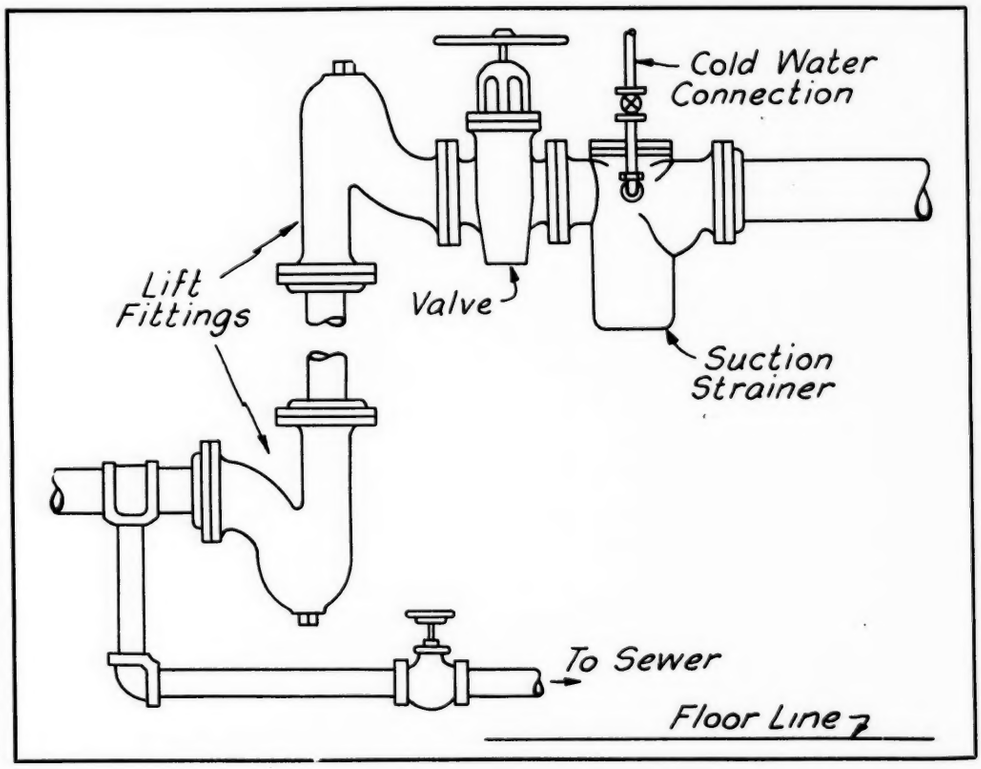


Fig. 2. Typical application of lift fittings.

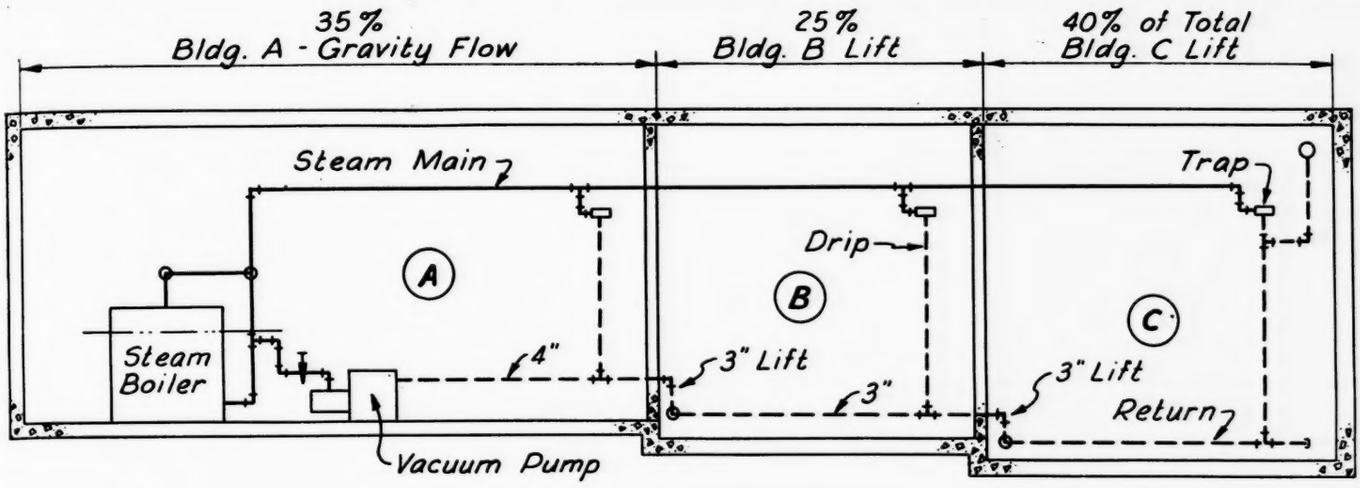


Fig. 3. Example of lifts in part of building, return by gravity in another part.

The writer cannot prove at present that the worst lift should be nearest rather than farthest from the pump, but hopes to prove it some day by actual installation. It seems reasonable that the vacuum should take on the worst obstacle first, so that there will be less drop-off from the higher vacuum build-up as the second obstacle is negotiated.

Sequence of Operation

As an example of how lifts work or do not work, consider Fig. 3 where the first section of a building returns condensation to the pump by gravity. Since only 35% is so returned, the larger balance of 65% must be delayed, eventually to return by lifts. Let's say that the installation is intermittently fired. The pump starts up from a cold condition exhausting air from the returns for a period. Then steam is finally generated to flow out through the system to push the air through steam pipes and radiators out into the returns. Meanwhile, all traps are open and remain so until condensate is eliminated as steam arrives. The traps will then be closed by the steam and only then can the pump start to build up a vacuum differential in the return piping.

When the pump has built up a vacuum of 3 in., say in 20 minutes, it will do useful work in exhausting air from the returns of the gravity section and may exhaust itself in doing so. Meanwhile, steam will reach the next section, *B*, and may push up condensate in the first lift. This operation of building up a vacuum and removing air and water starts all over as each section is served.

The three sections will be freed of air and water in succession. It may be another 20 minutes before section *B* is freed, or perhaps one hour altogether before conditions in all sections are equalized. Until this takes place, there will be hammering, surging, and fluctuations in the system. Sections are never equal in air and water capacities, in air and steam leakage, or in time served.

Farthest Section Most Troublesome

In starting from a cold condition the last section on the end of the system builds up a high vacuum by natural condensation, a vacuum that may be greater than that as yet established by the pump. There is then an opposing vacuum tending to back flow of air and water, so that traps dump into the cold water of a water-logged return. In such a case, the end drip of this last-served section will obviously become a tough one and the steam supply to this section will be temporarily impaired.

As a help for this last section, a self contained air eliminator with air vent check should be installed, as shown (Fig. 3). Possibly insulation of the return would also help to reduce too high a vacuum at the far end, since sizable returns of considerable length extract so much heat from the return water that not enough is left to furnish the latent heat for re-evaporation at lower temperatures and pressures. In this event only

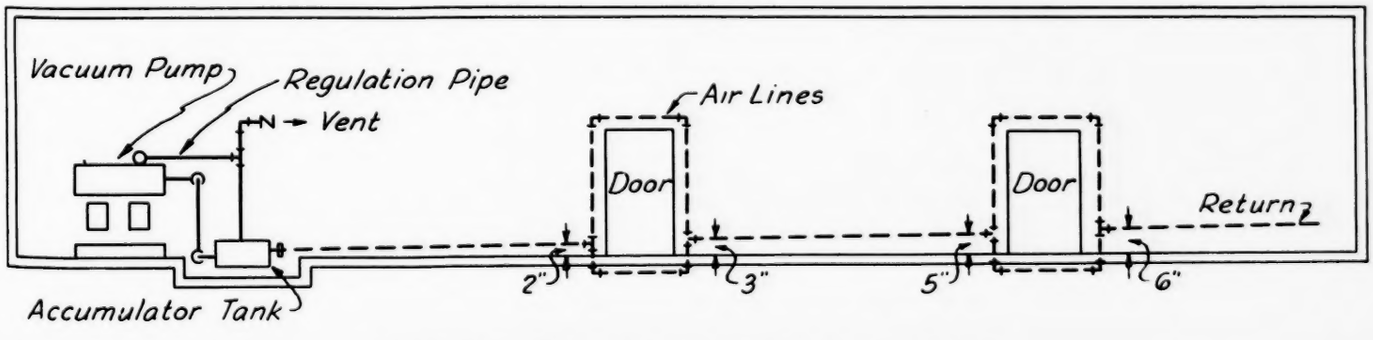


Fig. 4. Air lines carried over doors as is usually done.

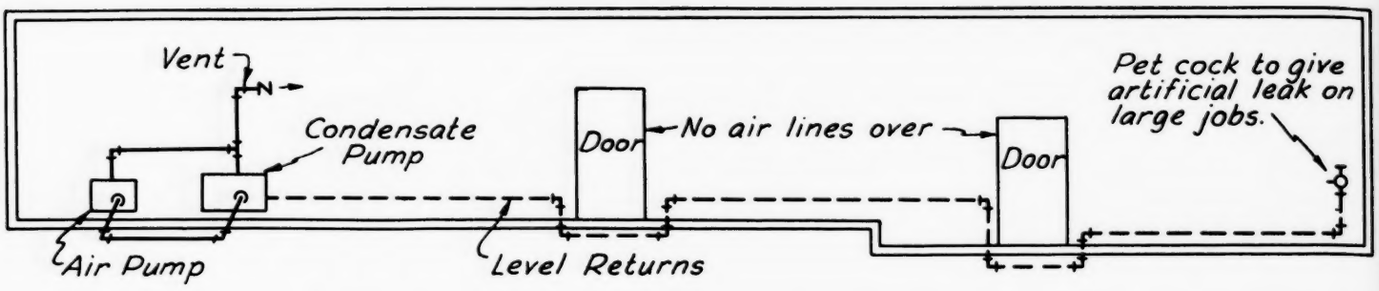


Fig. 5. No air lines over doors, returns run level, with one lift used.

sensible heat is extracted from the return water, so that its temperature will not correspond to that it is expected to have by steam tables for the high vacuum carried. A thermometer and gauge on a return sometimes show surprising differences.

Keep Return Pipe Sizes Down

Throughout the system, return pipe sizes should be kept down in order to reduce the burden of air on the pump. Reduction of air leakage is another reason for keeping pipe sizes down. It has always seemed to the writer that a 2 inch pipe joint presented less of an air leak hazard than one of, say, 4 inch size.

Vent Near Pumps Will Help

Steam flow is more rapid than air removed by the pump. It gets ahead of the air or rather pushes the air ahead, compressing the air until the long suction arm of the pump reaches the air and gradually expands it. Adding a vent near the pump (Fig. 4) for relieving some of the compressed air when starting up will greatly assist the pump. In time the traps are reached by steam and close, making the system a closed one. The return air may then be pictured somewhat as an elastic band, stretching more and more to keep the same relative density and expanding into the vacuum built up.

Vents Over Doors or Two Pumps

In Fig. 4, air lifts or vents are shown carried over the doorways as usually done, although for a similar situation an owner wanted these vents omitted to save money. This condition is shown in Fig. 5, the returns dropping below some ten or twelve doorways and being level except for a lift at the worst end of the system. When this system was finally started up, the vacuum at the end was greater than at the pump, though in time there was 14 inches at the pump with 8 inches or 9 inches at the far end, the system as a whole being tight against leakage.

The absence of air loops was overcome by spending not only the money saved by no loops, but more besides for two pumps, one for condensate and the other for air and a high capacity. In addition to the pumps, a pet-cock was installed at the far end of the system as shown in Fig. 5 to give an artificial or controlled air leak. The job was a large one, so that the air input was relatively low. It served to put a little pressure on that end to get air back of the water and push.

Fig. 6 shows the correction of another job by means of an air vent, *D*, installed as a corrective over the water seal. The pump had to carry a higher vacuum just because of the lift fitting at the rise, though such operation would have been unnecessary had the air vent been there from the start. The seal was originally installed on a system needing repair and with some traps blowing steam, the seal preventing the heat and great volume of steam from flowing to the pump, but eventually the water itself became too hot for the pump to handle.

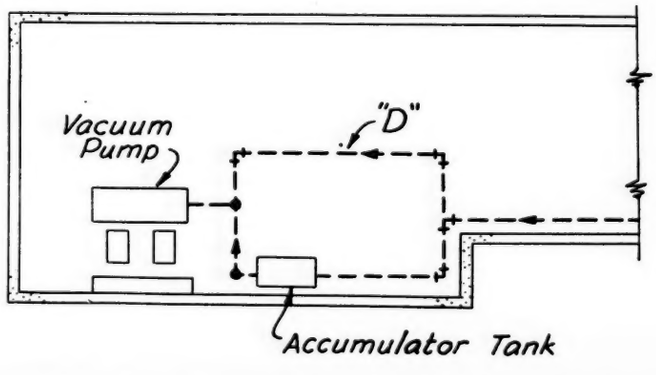


Fig. 6. Air vent, D, installed as corrective to water seal.

Avoid Lifts at Unit Heaters

Lifts are frequently used, one at each unit heater, to keep the return main well up and out of the way. In such cases, the condensate will be lifted up as long as the pressure on the steam main and the vacuum on the return are maintained suitable for the lifts, but there may come a time when lower differential pressures are desired or, for various reasons, cannot very well be avoided. If one keeps away from lifts he will have many less problems to solve, especially so when used with any form of air heater.

Lifts at unit heaters create still another hazard because of the characteristics of unit heater operation. While the fan is running, a unit heater condenses from eight to ten times more steam than it does when the fan is idle; therefore there is a definite pressure drop across the heater from supply inlet to return outlet. If, during the operation of the heater, the steam supply is curtailed or reduced, this pressure drop could result in an outlet pressure below atmosphere and approach or equal the return line vacuum. This would affect the lift directly, so that the heater would waterlog and deliver lowered temperatures, and possibly damage the steam traps.

Selection of
ANTHRACITE HEATING EQUIPMENT
for Commercial and Industrial Buildings

NORMAN C. CURTIN
Supervisor, Anthracite Institute
Field Representatives

Selection of

Anthracite Heating Equipment

for Commercial and Industrial Buildings

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Supervisor, Anthracite Institute Field Representatives

The case for anthracite as a fuel for commercial and industrial buildings is set forth with a description of fuel and equipment characteristics.

ANTHRACITE has a number of characteristics which recommend it for commercial and industrial applications; and equipment for anthracite utilization in such applications has reached a high level of development.

Fuel Characteristics

Some of the characteristics of anthracite which make it an attractive fuel choice for larger installations are: (1) low cost per Btu, especially in smaller sizes usually used in these applications; (2) low maintenance cost of equipment; (3) adequate and continuing supply; (4) non-smoking under all burning conditions; (5) safe to store in unlimited quantities.

Fuel cost per Btu is a major consideration in selection of any fuel burning equipment. Bearing in mind that efficiencies of various types of equipment enter into ultimate fuel calculations, Table 1, based on Anthracite Institute weighted averages, is a guide to comparison of fuels used in commercial and industrial buildings where boiler plant and buildings are designed to take maximum advantage of fuel characteristics. From 25% to 33% should be added to these equivalents for conversion installations.

The cost of maintaining fuel burning equipment is also an important factor in selection calculations. While no actual figures are offered, it is pointed out that anthracite burning equipment is basically simple and inherently rugged of construction with few fine adjustments and minimum heat exposure to moving parts.

The anthracite mines of eastern Pennsylvania are within economic range, by rail, water, or truck, of the northeast market area comprising 29% of the nation's population and 41% of total national manufacturers. The Pennsylvania deposits are estimated to be sufficient for at least 175 years.

Industrial and commercial users are especially likely to be interested nowadays in the smokeless burning properties of anthracite. The trend has been for enactment and enforcement of more and more municipal ordinances against smoke. In most cases the commercial user is the target of such action. Anthracite, however, is a completely smokeless fuel, no matter how it is burned.

Storage characteristics of anthracite are of real importance where certainty of supply and safety are prime factors. Anthracite can be stored in unlimited quantities without danger of spontaneous combustion or explosion. Some of the physical characteristics of anthracite useful in calculating storage space are listed in Table 2.

Equipment

Anthracite equipment for the commercial and industrial fuel user offers a wide range of application in all sizes of plants. In addition to the characteristics of the fuel, its performance in the proper equipment

TABLE 1—FUEL COMPARISON
(Based on 100% efficiency)

Anthracite Size	Btu per lb	Btu Equivalent	
		No. 2 Oil	No. 6 Oil
		Gals. Oil per ton Coal	
No. 1 Buckwheat	12,430	179	163
No. 2 Buckwheat	12,330	178	161
No. 3 Buckwheat	11,980	173	157

TABLE 2—PHYSICAL CHARACTERISTICS OF COAL AND ASH

Item	Maximum	Minimum
Coal, Steam Sizes		
Cubic feet per ton	40.3	33.0
Pounds per cubic foot	60.6	49.5
Angle of repose, degrees[1]	36.0	28.0
Anthracite Ash[2]		
Cubic feet per ton coal	12.0	9.0
Bushels per ton coal	9.0	7.0
Pounds per cubic foot	45.0	25.0
Angle of repose, degrees	57.0	40.0

[1]The angle with the horizontal at which material will stand when piled. The angle of repose varies with size and shape of pieces, moisture content, method of piling, and the surface on which piled.

[2]Figures for ash characteristics are very general and vary with percentage of ash in coal, combustion efficiency, and whether fine or clinkered.

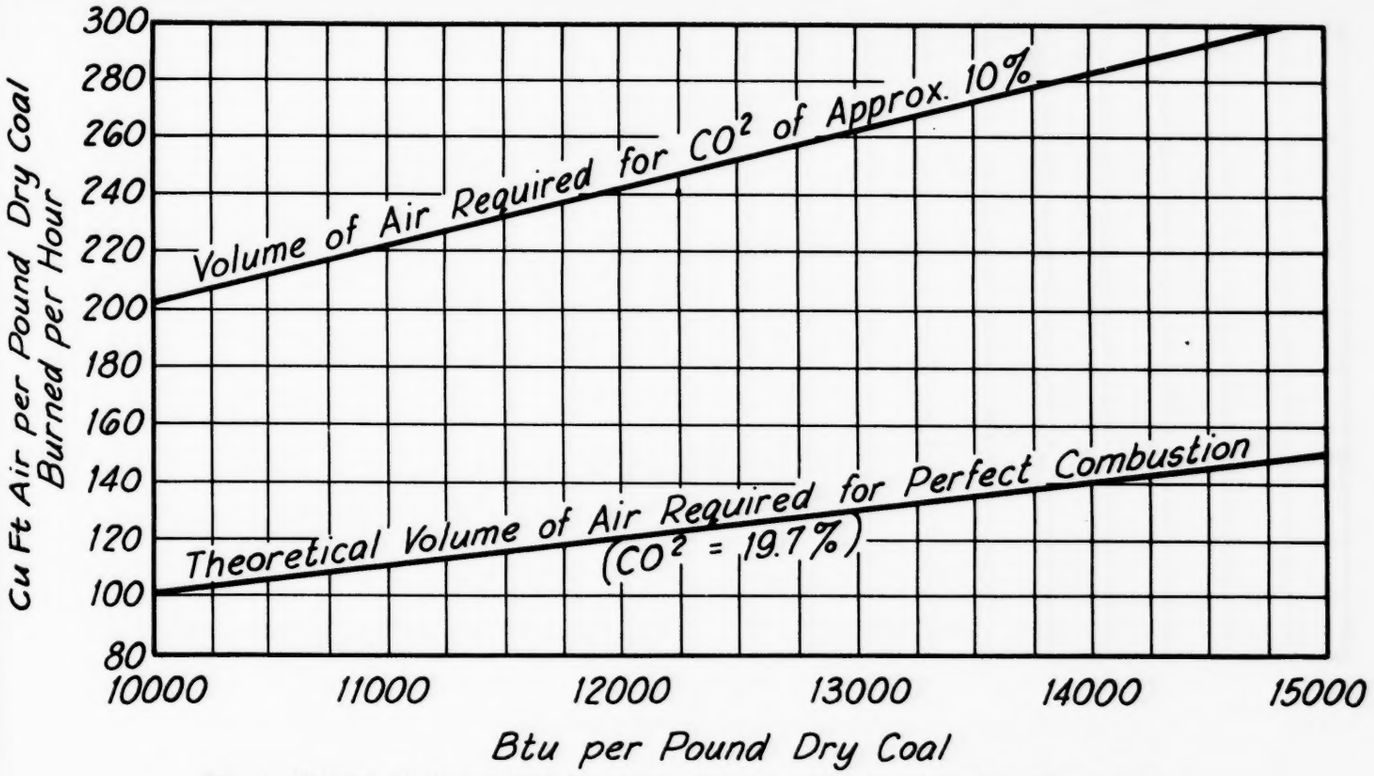


Fig. 1. Volume of air required for combustion of anthracite of various Btu content.

can make it well suited to utilization in such buildings as apartment houses, business buildings, schools and government buildings, clubs, hospitals, restaurants, hotels and power plants.

The proper anthracite heating and power equipment for such commercial and industrial buildings can be selected according to need. The following general classes represent the main types of equipment available:

(1) Grates and blowers with mechanical draft for the hand-fired job;
(2) Small round underfeed stokers;
(3) Rectangular retort underfeed stokers;
(4) Chain grate stokers;
(5) Traveling grate stokers.

The fuel used in all these general types of equipment is included in the designation "steam sizes." These anthracite sizes are called No. 1, No. 2, No. 3 and No. 4 buckwheat. To aid in guiding the potential user in making the correct selection of anthracite equipment for the job he needs performed, any special points relating to these steam sizes will be discussed in connection with the general types of equipment.

The Hand-Fired Job

The selection of grates for the hand-fired job will be governed by the size of anthracite which has been selected as well as the amount of labor available for firing and cleaning of the fires. Table 3 shows the recommended maximum grate mesh openings for using the steam sizes of anthracite.

These mesh sizes apply to grate openings except where the sifting of fines through the grate is prevented by the design.

The grate may be of the sectional dumping type whereby the fireman can clean fires in sections rather than cleaning the entire grate area. This offers the advantage of maintaining the necessary steam production rate of the boiler during the cleaning period.

Grates may also be of the stationary type with pinhole openings for air distribution. Under such a system, ash can be removed from each half of the grate at different times in order to maintain steam production of the boiler. Under such a system, the ash must be removed through the fire door.

Mechanical Blower Selection

Since the smaller sizes of anthracite generally offer fuel bed resistance which cannot be overcome with natural draft, it is necessary to provide mechanical means for supplying the air to the fuel bed. This can be accomplished by the use of either a forced draft fan (which keeps the ash pit under pressure) or by means of an induced draft fan located between the boiler and the stack or as a part of the stack itself.

Volume of air required for the combustion of any solid fuel is in direct proportion to its heating value and the pounds to be burned. Fig. 1 shows that for steam sizes of anthracite having a heating value of 12,500 Btu per pound, it would be necessary to supply 125 cubic feet of air per pound of dry coal burned for perfect combustion (CO_2 = 19.7%). In actual practice, however, it is customary to supply 100%

TABLE 3—MAXIMUM GRATE MESH OPENINGS

Size Designation	Mesh Opening, Inches
No. 1 Buckwheat	1/2
No. 2 Buckwheat (rice)	1/4
No. 3 Buckwheat (barley)	1/8
No. 4 Buckwheat	1/16

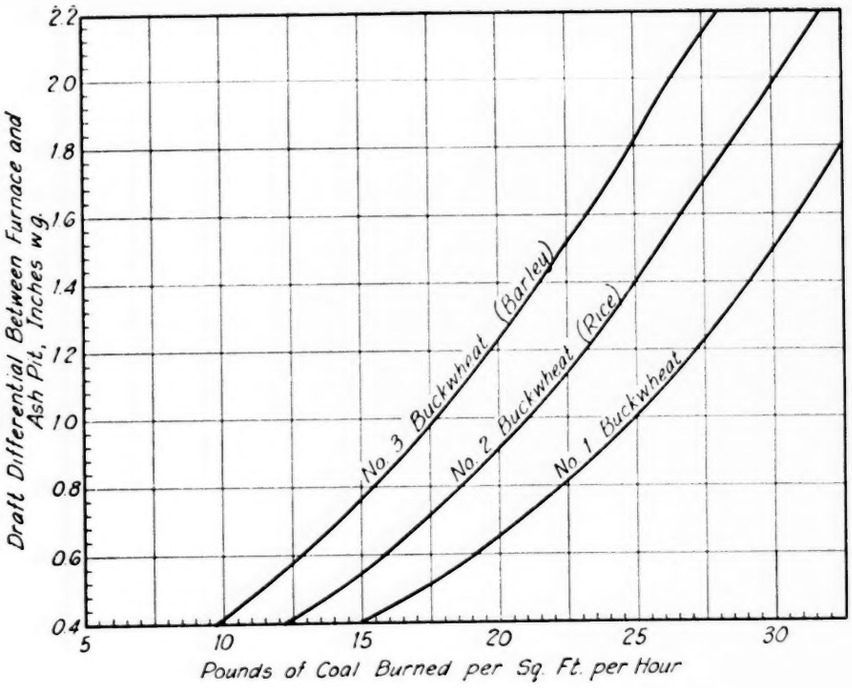


Fig. 2. Draft required at different combustion rates for anthracite.

excess air with actual CO_2 of approximately 10%. This would require the furnishing of 250 cubic feet of air per pound of dry coal used. Since the air supply must overcome the static resistance of the fuel bed, it is necessary that this air be delivered at a pressure in proportion to the resistance of the various sizes of anthracite.

Fig. 2 shows the resistance of various sizes of anthracite at various rates of combustion of coal per hour. For example, if No. 1 buckwheat were selected and the burning rate set at 20 lb coal per square foot per hour, the blower must deliver air to the ash pit at a pressure of .62 inches w.g. for fuel bed thickness normally used. If No. 2 buckwheat, or rice, were used at the same combustion rate, the ash pit pressure would be .90 inches w.g. If, in this same boiler requirement, we were burning on a grate area of 10 sq ft, our maximum fuel burned would be 200 lb coal per hour, and we would have to furnish 833 cfm of air.

$$(\text{CFM} = \frac{250}{60} \times \text{pounds of coal per hour})$$

Small Round Underfeed Stokers

Mechanical underfeed stokers with round retorts may be applied to plants with total steam heating loads not to exceed 2,800 sq ft of equivalent direct radiation, or to small processing high pressure boilers up to 20 boiler horsepower. These stokers may be of the hopper type in which the operator manually fills the hopper containing 500 to 700 lb coal, which in turn is fed automatically to the retort by the stoker worm in response to the control system. Bin feed stokers which eliminate the manual handling of fuel and feed directly from the bin to the stoker retort may also be applied within the same load limits. Such stokers may be equipped with mechanical ash removal which removes ash from the base of the boiler by means of a conventional stoker worm combined with a scraper or buckwheat elevator which deposits the ash into dust-tight containers. Stokers of this type use No. 1 buckwheat or No. 2 buckwheat (rice). A single motor provides the power for feeding the fuel, running the forced draft fan which supplies air to the stoker retort, and operating the mechanical ash removal system.

Rectangular Retort Underfeed Stokers

For commercial and industrial heating, power, or processing loads in excess of 20 boiler horsepower, the rectangular retort underfeed stoker may be applied. These stokers have a capacity range of fuel feed of from 100 to 1,000 pounds of rice per hour. Test efficiencies of such units will run as high as 75%, and, in actual practice, efficiencies of 67% can be maintained. Assuming a heating value of rice size anthracite at 12,000 Btu per pound, units of this design can take care of approximately 240 boiler horsepower or 33,600 sq ft E.D.R. steam radiation or 53,760 sq ft of E.D.R. gravity hot water radiation. Combustion rates per square foot of grate area will vary with the design of the stoker grate and will depend on whether or not the grates are of the stationary design or moving design. In the stationary design, the burning rate should not exceed 15 to 16 lb per (sq ft) (hr), and with the moving grate, from 18 to 22 lb per (sq ft) (hr).

Coal may be stored in manually filled hoppers from which it is automatically fed to the base of the stoker retort. From this point the coal is fed by means of a ram which provides uniform distribution of coal in the retort.

Because of the high fusion temperature of anthracite ash and the uniformity of the coal, no manual attention is required in order to maintain high burning efficiencies. In the case of anthracite, dump grates may

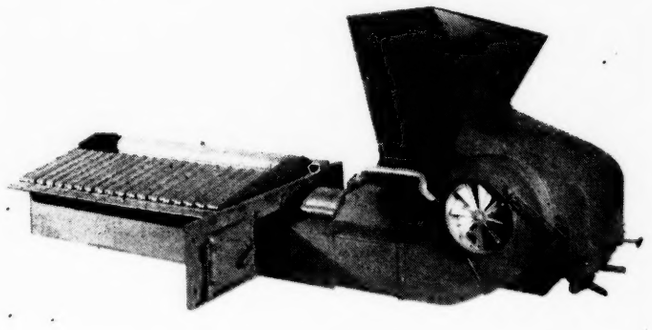


Fig. 3. Rectangular retort, side feed stoker. (Flynn and Emrich)

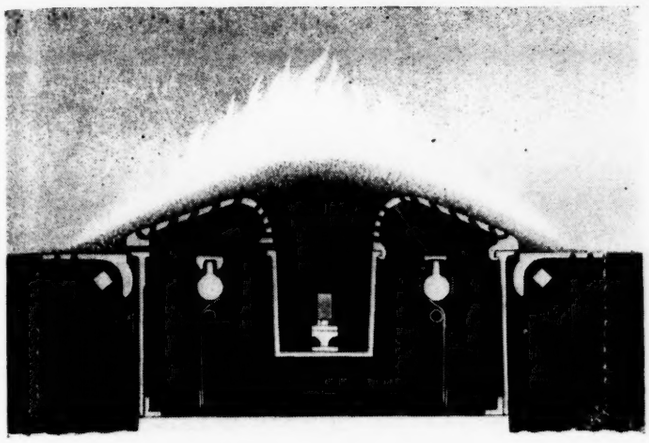


Fig. 4. Cross-section of center-feed rectangular retort stoker. (C-E Skelly)

be operated in a lowered position for a continuous discharge of ash into the base of the boiler. This makes the fire self cleaning and the burning of fuel and discharge of ash automatic.

Such stokers are furnished in a so-called center retort design, in which the coal feeds in both directions from the center of the retort to both boiler side walls, or in the side retort type in which the stoker retort is located adjacent to one boiler wall and the spillover grate on the opposite wall so that the coal flows in only one direction. Stokers of this design range in length from 3 to 7½ ft, and in width from 2½ to 7½ ft. For furnace widths of 4½ ft or less, the retort may be of the side feed type, and, for those from 4½ to 8½ ft, they should be of the center feed retort type. Where the furnace width is 4½ ft or more, retorts of the moving grate bar design are preferred.

Coal feed rates can be adjusted to firing loads through a variable speed transmission to provide as many as 16 different burning rates on a single unit. Air is supplied by a forced draft fan, the volume and pressure of which can be regulated for varying fuel feeds by a manually operated damper on the fan inlet. The stokers may be controlled automatically by means of pressure or temperature controls actuated by steam pressure. Further convenience may be secured by the application of an auxiliary coal feed mechanism for feeding the coal from the bin to the stoker hopper. Such devices are operated by a separate motor which is controlled manually by the operator.

TABLE 4—COMBUSTION RATES AND GRATE OPENINGS FOR CHAIN GRATE STOKERS

Size of Fuel	Combustion Rate, lb per (sq ft) (hr)	Size of Grate Opening, Inches	% Air Space in Grate Bar
No. 1 Buckwheat...	up to 40	5/16 to 3/8	30 to 33
No. 2 Buckwheat (rice).....	30 to 35	1/4 to 5/16	19 to 25
No. 3 Buckwheat (barley).....	22 to 25	1/8 to 3/16	12 to 14
No. 4 Buckwheat...	20 to 22	3/64 to 3/32	8 to 10

Chain Grate Stokers

The grate for units of this type consists of replaceable links assembled on round steel rods. Driving sprockets located in the front transmit a forward movement of the grate from front to rear. After passing over the rear sprocket, the grate returns underneath to the front and the cycle is repeated, thus making the grate self cleaning at all times.

Coal is fed continuously from a hopper, which may be filled manually or from overhead storage bunkers, and passes under a refractory lined grate which may be adjusted for varying depths of fuel beds.

Air is supplied mechanically into several air compartments between the upper and lower strands of the grate. Each compartment is equipped with dampers for controlling the volume and pressure in the various zones.

Table 4 shows combustion rates generally used in stokers of this design.

Capacities

Steam generating capacities range from 1,400 to 70,000 pounds per hour for units designed by one manufacturer, and from 3,500 to 200,000 pounds by another.

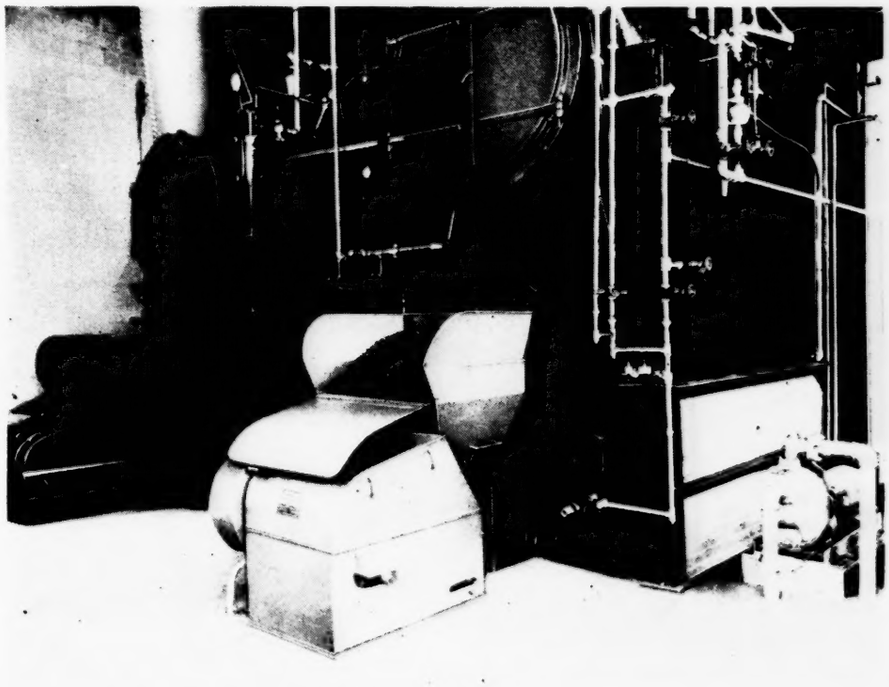


Fig. 5. Hopper-feed C-E Skelly underfeed stoker. (Combustion Engineering-Superheater, Inc.)

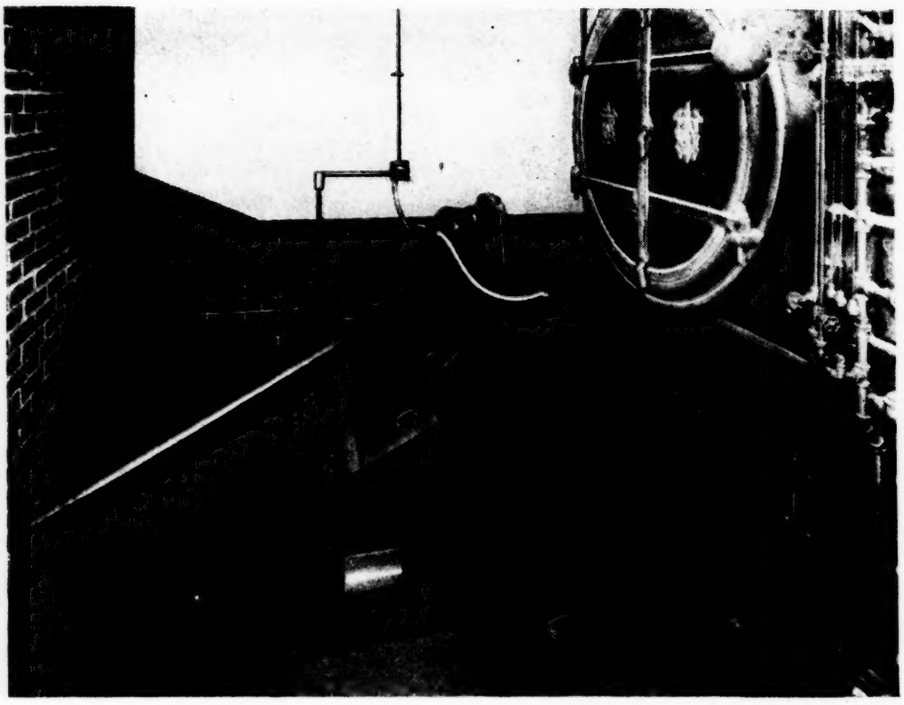


Fig. 6. Bin-feed Skelly underfeed stoker (Combustion Engineering-Superheater, Inc.), at Reading, Pa., school.

Burning rates of units in operation average 30 lb per (sq ft) (hr) using No. 3 and No. 4 buckwheat size anthracite. These rates vary from 18 lb to a peak of 43 lb per sq ft for periods of 12 hours duration.

The range of efficiency of chain grate stokers as recorded in code tests is from 65 to 75%.

Traveling Grate Stokers

Traveling grate stokers may be applied to boilers having approximately the same range as those which can be met by stokers of the underfeed design. The stoker grate consists of keys which are mounted on cast iron bars, in turn attached to forged steel driving chains which travel around the supporting frame. The coal is stored in hoppers which may be filled manually from fuel bins located at the level of the boiler room or from overhead bunkers piped directly to the stoker hopper. Fuel is fed continuously to the grate as it passes below the hopper located at the front end of the furnace. The coal is carried gradually from the front into the furnace where combustion is complete and air is supplied at various pressures and volumes so that as the fuel reaches the rear of the furnace, it is completely burned and the ash is spilled off the end of the traveling grate. The speed of the grate and consequently the burning rate can vary over wide ranges to permit the stoker to meet variable loads of the plant.

Photoelectric cells to control the speed of the moving fuel bed have been applied to the rear of the furnace on the boiler side wall. The intensity of light in the fuel bed strikes the electric eye, causing the stoker to move or stop. When light strikes the photoelectric cell, the moving fuel bed stops and, when ash appears, a small motor starts the fuel bed in motion again. This prevents the deposit of excess combustible material into the ash and maintains a live grate area over the entire length of the grate.

The air which is supplied by means of a mechanical forced draft blower can be supplied at controlled

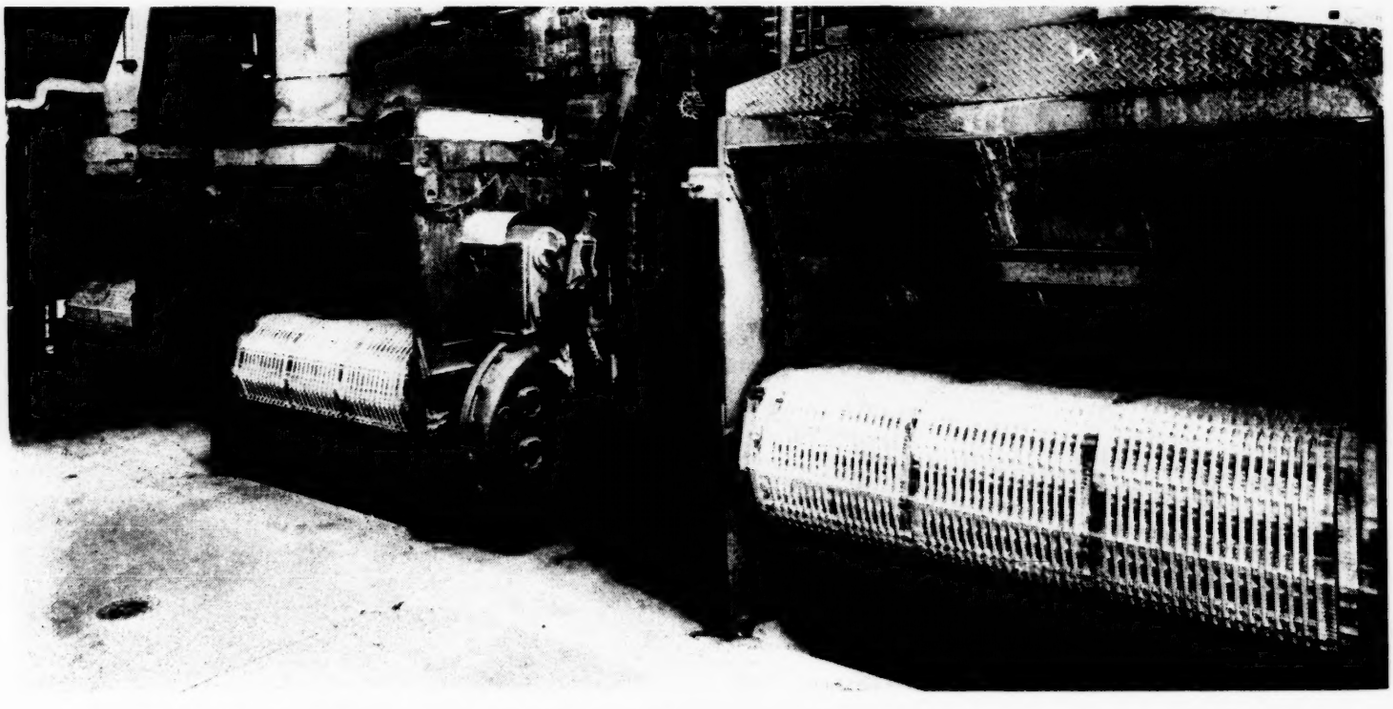


Fig. 7. Three McClave chain grate stokers under International boilers at Natona Mills, Dallas, Pa.

TABLE 5—PRINCIPAL TYPES OF EQUIPMENT FOR BURNING ANTHRACITE

Class of Equipment	Typical Manufacturers	Description of Equipment Sizes and Uses	Coal Size (bracketed numbers refer to choice)	Desirable Properties
COMMERCIAL AND INDUSTRIAL HAND-FIRED EQUIPMENT				
Stationary Grate				
Herringbone Pyramid Pin-Hole	Carbondale Grate Bar Co. Scranton, Pa. Pyramid Grate Corp. Philadelphia, Pa. Various Foundries	Commercial and small industrial sizes. Division of tonnage used by various types of commercial hand-fired equipment not available; but all types together are probably accounting for some 400,000 tons of barley and the bulk of 4,500,000 tons of rice annually, also for most of the No. 1 buckwheat not burned in domestic equipment. (7,763,000 tons in 1946)	(1) Rice or No. 1 buckwheat (cost the only adverse factor for the latter) (2) Barley Combustion rates: 18-26 lb/hr with No. 1 buckwheat 18-23 lb/hr with rice 15-20 lb/hr with barley	Clinkering Uniform size Reasonably low ash
Dumping Grate				
Slotted	Carbondale Grate Bar Co.			Soft to medium clinker desired to facilitate dumping Size of less importance than on stationary grate
Herringbone	The McClave Co. Allentown, Pa.			
Shaking Gate	Combustion Engineering Co. and others			Non-clinkering Uniform sizing
Semi-Stokers				
(hand-operated)	The McClave Co.	Sizes from 100 to 600 hp. Largest approximately 12 x 14 ft grate area, 7 x 10 ft minimum setting required. Combustion rate: 25 lb/hr with rice 23 lb/hr with barley	(1) Rice or No. 1 buckwheat (2) Barley	Non-clinkering or soft-clinkering. A grate is made for screenings, culm or poorly sized fine coal, but special installation including blower must be designed for its use or decreased ratings will result.
AUTOMATIC BURNERS				
Domestic Underfeed Stokers	Various	Sizes available to approximately 95 lb/hr (2850 E.D.R. steam) with buckwheat coal. Some models as good with rice coal, giving 10 to 20% less output and burning up to 75 lb/hr	(1) No. 1 buckwheat (2) Rice	Ash fusion point above 2750F. Uniformity of sizing very important. Coal should be screened for bin-feed models.
Domestic Moving-Grate Boiler-Burners	Losch Furnace Co. Schuylkill Haven, Pa.	Sizes from 450 to 7200 sq ft E.D.R. steam. Sales largely in anthracite region and urban centers	(1) Barley (2) Rice	Non-clinkering, or very soft clinker only. Sizing not too important
Single-Retort Underfeed Stokers	Combustion Engineering Co., New York, N. Y.	The Skelly stoker comes in sizes from 7 to 45.5 sq ft of projected grate area, burning from 114 to 935 lb/hr with rice coal	(1) Rice (barley not recommended)	Non-clinkering, or very light-clinkering coal. High friability. Reasonably low ash content.
	Flynn & Emrich Co. Baltimore, Maryland	F & E stoker is sold in several sizes with 7 to 45 sq ft of projected grate area and burning rates with rice coal of 114 to 922 lb/hr		
Small Traveling Grate Stoker	Hazelton Stoker Hazelton, Pa.	Smallest practical size approximately 20 sq ft of grate	(1) Barley (2) Rice	Uniform sizing desirable but not essential.
Chain Grate Stoker	Illinois Stoker Co. Riley Stoker Co. The McClave Co.	Traveling grate differs from chain grate in that surface links can be removed without disturbing continuity of chain	(1) No. 4 buckwheat (2) No. 3 buckwheat (3) Rice (for very small units or where grates are in poor condition)	Uniform sizing desirable but not absolutely essential.
Traveling Grate Stoker (Coxe)	Combustion Engineering Co.			

Note: In 1947, there were 1,450 stokers burning steam sizes of coal at a rate of 5,085,000 tons per year.

Fig. 8. Three Flynn and Emrich underfeed stokers. Two in foreground serve one 300-hp boiler.

volume and pressure by means of inlet dampers located in zoned wind boxes throughout the length of the grate.

Capacities

Large traveling grate stokers range in size from 50 to approximately 500 sq ft of grate area. Modern combustion technology has developed increased grate speed and reduced fuel bed thickness so that units burning No. 4 buckwheat anthracite in fuel beds of 2 to 2½ inches thickness and grate speeds of 110 ft per hr are extremely efficient. Steam generating capacities of from 10,000 to 100,000 lb per hr are now available.

Burning Rates

Average burning rates for Hazelton traveling grate units are from 15 to 26 lb per (hr) (sq ft) of grate area. Peak demands for short periods are obtainable at rates of 30 lb per (hr) (sq ft). Coxe traveling grate stokers burn No. 3 and No. 4 buckwheat at combustion rates ranging from 22 to 35 lb per (sq ft) (hr). Rates as high as 50 lb per (sq ft) (hr) have been maintained for an entire month and 60 lb for short peak periods.

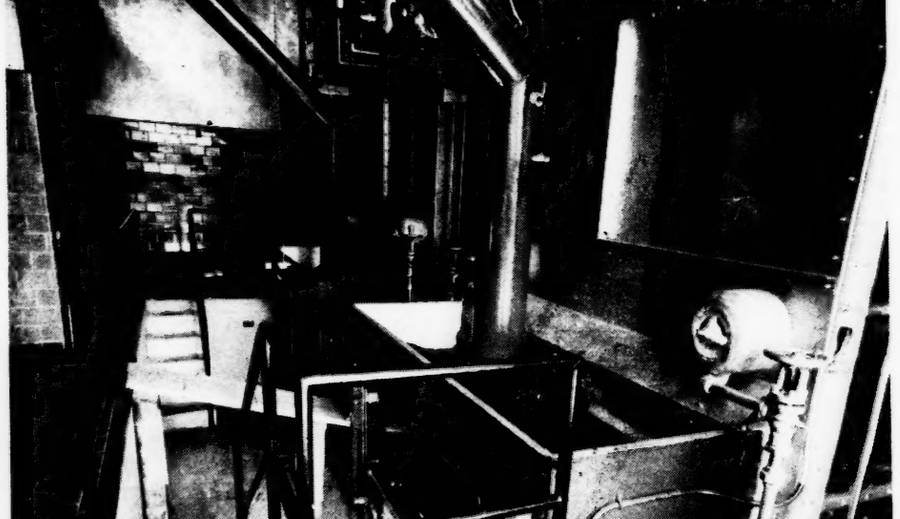


Fig. 9. Hazleton traveling grate stokers (Coxe Stoker Engineering Co.) under Keeler CP boilers at Sterling Hotel, Wilkes-Barre, Pa.

For Hazelton units, tested under the standard code, efficiencies varied from 72 to 75% with No. 3 buckwheat (barley) and from 69 to 72% with No. 4 buckwheat.

Coxe units, using auxiliary heat recovery equipment, have produced efficiencies of 82 to 83% with carbon losses to the ash of 3 to 5%.

Table 5 presents a resume of anthracite burning equipment.

Traveling grates differ from chain grates in that surface links can be removed from chain grates without disturbing the continuity of the chain. Moving grate stokers are among the most flexible means of burning anthracite. Troublesome slag clinker, usually caused by uneven fuel bed, can be overcome by increasing the air supply in the area where the slag forms.

DRAFT IN SMALL RESIDENTIAL CHIMNEYS

The theoretical draft to be expected from a residential chimney can be expressed by the formula

$$D_t = .255\ bH\left(\frac{1}{T_o} - \frac{1}{T_e}\right) \quad \ldots\ldots(1)$$

where D_t = draft in inches of water,
b = barometric pressure, inches of mercury,
H = height of chimney, feet,
T_o = outside air temperature, absolute F, and
T_e = flue gas temperature, absolute F.

As can be seen, the higher the outside temperature the lower the draft. Consequently, for design purposes the outside temperature can be taken at 60F ($T_o = 520$). The barometric pressure can be taken at 29.92 inches. The *actual* draft *D* can then be shown to be

$$D = SEH \quad \ldots\ldots(2)$$

where *E* is the efficiency of the chimney, *D* is the actual draft in inches of water, and *S* is a value combining the constant .255, *b*, T_o and T_e and represents the theoretical friction per foot of chimney height. Values for *S* are given in the head of Table 2 for flue gas temperatures from 200 to 1000F and based on a barometer of 29.92.

The efficiency of residential chimneys 10 to 25 ft in height and with 35 to 55 sq in. cross-sectional area has been shown by Schmitt and Engdahl (in tests at Battelle Memorial Institute and reported in "Performance of Residential Chimneys," American Society of Heating and Ventilating Engineers) to vary with the weight of flue gas per hour and flue gas temperature. The relationship is indicated in Table 2, based on curves in the ASHVE paper referred to.

Since it is necessary to know the weight of flue gas to determine the efficiency, information for computing flue gas weight is given in Table 1A and 1B. Whether Table 1A or 1B is used depends on the information available—whether CO_2 content of the flue gas or the percentage of excess air. The following problems illustrate the use of the data.

TYPICAL PROBLEMS

Problem: What draft is to be expected at 60F outside temperature from a 17-ft chimney when burning 13 lb of bituminous coal per hour with 80% excess air and with a flue gas temperature of 600F?

Solution: From Table 1A, for bituminous coal, and for 80% excess air, find 21 lb of flue gas per hour per pounds of fuel burned. If 13 lb of coal are burned, the flue gases would total $13 \times 21 = 273$ lb.

From Table 2, for a flue gas temperature of 600F, find S = .00748 and, under 600F, opposite 250 lb of flue gas, find E = 79; opposite 300 find E = 77. Interpolating for 273; E = 78%.

Then D = SEH

$D = .00748 \times .78 \times 17 = .099$ inches of water draft.

Problem: A bituminous-coal-burning ranch-type residence with a 14-foot chimney is located in a mountain city at an altitude of 6000 ft above sea level. What draft can be expected at 60F outside if the plant burns 11 lb of coal per hour at

TABLE 1A. WEIGHT OF FLUE GAS FOR TYPICAL FUELS AT VARIOUS PERCENTAGES OF EXCESS AIR

Fuel	Excess Air, Per Cent				
	20	40	60	80	100
	Pounds of Flue Gas per Unit of Fuel Burned. Units of Fuel are: Solid Fuels, Pounds; Liquid Fuels, Gallons; Gaseous Fuels, Cubic Feet				
Coke	15.0	17.5	20.0	22.5	25.0
Anthracite	14.9	17.4	19.8	22.3	24.8
Semi-bituminous	14.8	17.2	19.7	22.1	24.6
Bituminous	14.1	16.4	18.7	21.0	23.4
No. 2 fuel oil	127	149	170	191	212
Coal gas	0.47	0.55	0.62	0.70	0.78
Water gas	0.25	0.29	0.33	0.38	0.42
Natural gas	0.96	1.12	1.28	1.44	1.60
Mixed gas	0.46	0.53	0.61	0.68	0.76

TABLE 1B. WEIGHT OF FLUE GAS FOR TYPICAL FUELS AT VARIOUS PERCENTAGES OF CO_2 IN FLUE GAS

Fuel	Per Cent CO_2 in Flue Gas				
	6	8	10	12	14
	Pounds of Flue Gas per Unit of Fuel Burned. Units of Fuel are: Solid Fuels, Pounds; Liquid Fuels, Gallons; Gaseous Fuels, Cubic Feet				
Coke	43.7	32.5	26.2	21.8	18.8
Anthracite	40.6	30.6	24.4	20.4	17.4
Semi-bituminous	38.7	28.9	2.32	19.3	16.5
Bituminous	36.0	27.3	21.6	17.9	15.3
No. 2 fuel oil	272	204	162	135	114
Coal gas	0.78	0.59	0.46	.....	.....
Water gas	0.63	0.47	0.38	0.32	0.27
Natural gas	1.60	1.20	0.96	.....	.....
Mixed gas	0.80	0.60	0.48	0.40	.....

TABLE 2. THEORETICAL DRAFT PER FOOT OF CHIMNEY AND CHIMNEY EFFICIENCIES AT 70F OUTSIDE TEMPERATURE AND 29.92 INCHES OF MERCURY

Lb. of Flue Gas per Hour	Flue Gas Temperature, F								
	200	300	400	500	600	700	800	900	1000
	Value of S, Theoretical Draft per Foot of Chimney								
	.00312	.00463	.00580	.00673	.00748	.00810	.00860	.00906	.00943
	Chimney Efficiency, Per Cent								
50	50	52	55	57	59	60	61	61	62
100	64	67	70	72	75	76	77	79	80
150	68	71	75	77	80	81	82	83	85
200	65	70	76	78	80	80	81	82	83
250	62	68	74	76	79	80	81	82	82
300	57	64	70	73	77	78	79	80	80
350	48	55	63	67	72	73	74	75	75
400	37	46	56	61	66	67	68	69	70
450	25	37	49	54	60	62	63	64	65
500	10	26	41	47	54	56	57	59	60
550	—	15	33	40	47	49	50	52	53
600	—	—	22	30	39	41	53	45	47

9% CO_2 in the flue gas at a flue gas temperature of 800F?

Solution: From Table 1B, under 8% CO_2 and 10% CO_2, and opposite Bituminous, find 27.3 and 21.6. Interpolate for 9% and obtain 24.5 lb of gas per hour per lb of coal. This totals $11 \times 24.5 = 269.5$ lb of flue gas per hour for the plant in question. Inasmuch as b is not 29.92, due to the altitude, find D_t by using equation (1).

The normal barometer at high altitude is about as follows:

Altitude, Feet	Barometer, In. of Mercury
2000	28
4000	26
6000	24
8000	22

so that for the location in question $b = 24$ inches. Substitute in equation (1)

$$D_t = .255 \times 22 \times 14 \times \left(\frac{1}{460 + 60} - \frac{1}{460 + 800} \right)$$

$D_t = .089$ inches of water

From Table 2 find by interpolation between 250 and 300 lb and under 800F, an efficiency of 80%. Then, the actual draft will be $0.80 \times .089 = .071$ inches of water.

Problem: What draft can be expected under the worst outside temperature condition (60F) with a 24-foot chimney burning 1½ gallons of No. 2 fuel oil per hour with a flue gas temperature of 800F and a CO_2 content in the flue gas of 10%?
Solution: From Table 1B, under 10% CO_2, and opposite No. 2 fuel oil, find 162 as the number of pounds of flue gas per gallon of oil burned per hour. Since 1½ gallons are burned per hour, the flue gas weight is $1.5 \times 162 = 243$ lb.

From Table 2 find that for a flue gas temperature of 800F, the value of $S = .0086$, and under 800 and opposite 200 find the efficiency to be 81%; 81 also appears opposite 250, so that for 243 lb $E = 81$. Substituting in formula (2)

$$D = .0086 \times .81 \times 24$$

$D = .172$ inches of water

A Material for Industry

Insulating Material Doubles as Roof Decking

A RECENT development in insulating materials is a lightweight mineral, predominantly calcium silicate, manufactured under the trade name of Kaylo in two basic forms. One form is a low-density insulation which can be shaped into boards, blocks, or pipe covers of high flexural strength suitable for application to flat or widely curved surfaces and to standard pipes up to 10 inches in diameter. The second form is a higher-density structural product reinforced with wire mesh suitable for roof decking.

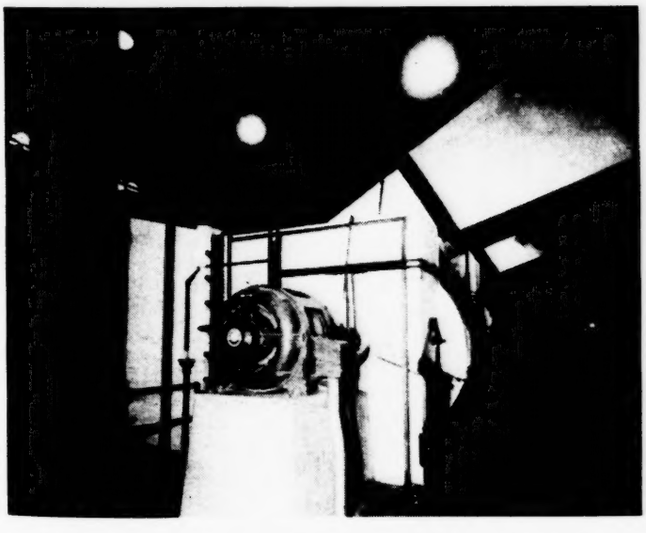
The low density material, for insulation of ducts, tanks, furnaces, ovens, pipes, etc., weighs 11 lb per cu ft and may be used over a temperature range from 70 to 1200F. The block is supplied in 3-ft lengths, 6 inches or 1 ft wide and 1 to 3 inches thick. The pipe insulation is supplied in the new simplified standard sizes in thicknesses of from 1 to 3 inches for standard pipes up to 5 inches in diameter and from 1½ to 3 inches for pipes 6 to 10 inches in diameter.

Insulation value of the insulation block and pipe covering is derived from its fine cellular structure. Conductivity (k) at 100F mean temperature is 0.41 (Btu) (in) per (hr) (sq ft) (F); at 500F mean temperature, k = .54. Insulating efficiency is said to improve after exposure to service temperatures.

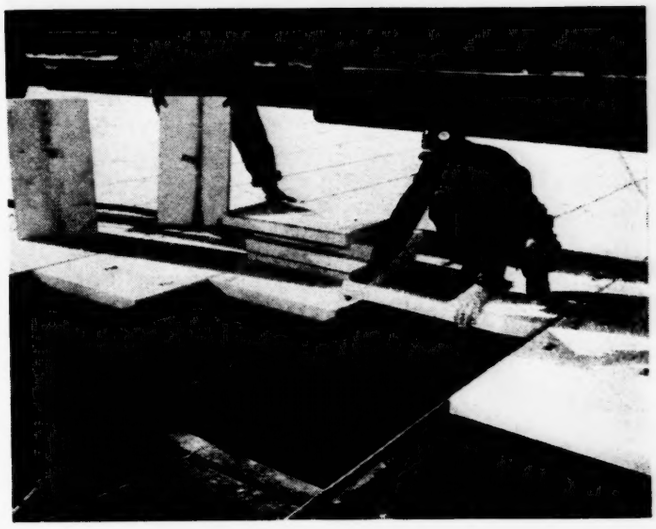
The material can be cut, scored, and sawed with ordinary woodworking tools. A compressive strength before heating of 150 lb per square inch and a flexural strength of 50 lb per square inch make the product adaptable for a variety of services.

Roof Tile

The insulating roof tile is a lightweight structural material produced in slabs 2⅝ × 18 × 36 inches.



Powerhouse fan and ducts insulated with Kaylo.



Kaylo roof deck being installed on rail type sub-purlins supplied with decking.

Basically the material is calcium silicate reinforced with mineral fibers and wire mesh. It has a density of about 20 lb per cu ft. Each tile weighs approximately 23 lb and has an area of 4½ sq ft.

This product is said to combine structural strength and thermal insulation in one material. The modulus of rupture is 175 lb per square inch. Compressive strength is approximately 500 lb per square inch. Flexural strength after soaking for 10 hours is approximately 85% of its dry strength.

Roof tile deck is applied in three steps—laying tile into place on sub-purlins, grouting end joints, and covering the deck with roofing materials. The roof tile can also be used with other types of steel framing or may be nailed to wood joists. The manufacturer of the roof tile also supplies either hollow box sub-purlins or steel rail sub-purlins for supporting the roof deck.

The roof tile is non-combustible. It resists a typical building fire, as defined in the standard A.S.T.M. time-temperature curve, for more than one hour. Insulating value of the roof tile is as follows:

Thermal conductivity *k*, (Btu) (in) per (sq ft) (hr) (F) 0.62

Overall heat transfer coef. *U*, Btu per (sq ft) (hr) (F)

- Roof tile only 0.20
- Roof tile + built-up roofing 0.19

Light reflectivity of the roof tile is approximately 80%.

Kaylo heat insulating block and insulating roof tile are manufactured by American Structural Products Company, Toledo, Ohio, a subsidiary of Owens-Illinois Glass Company.

Experience is my Classroom

By T. W. REYNOLDS

• WATER DAMAGE IN LAUNDERETTES

The heat reclaimer for launderettes described last month offers yet another advantage. It provides a factor of safety due to the slight additional storage it affords, and the foregathering of obstructing lint which might otherwise clog the strainer of the connecting waste sink or its trap at outlet to sewer and thereby overflow to flood the premises. This sink, as required by New York City regulations to form an indirect connection to the sewer, is a potential hazard, as the writer recently learned from the sad experience of others. A much better wording and revision of the regulations is required to reduce the hazard of flooding and the resulting contamination of goods and premises. This hazard can never be fully eliminated.

The accompanying drawing has been sketched from an actual installation wherein the two small sinks overflowed and damaged a considerable quantity of goods in the basement of a neighboring store before the situation was discovered. This happened not once, but several times; the installation will be corrected as shown by the one new sink of large size, at the left of the drawing. The other sinks will then be removed.

The sinks are located in a so-called storeroom, which, however, is empty and therefore seldom visited and not often enough so that trouble could be stopped in time. Electrical float switches to give an alarm in the launderette above were set so high that overflow would occur in a few seconds after the alarm went off, while watermarks 19 inches high in the meter room indicated that flooding continued for an hour or more.

The float switches were a later innovation after trouble had occurred. They were always failing and sometimes giving false alarms, due to surging in such small sinks, yet these sinks were in accord with regulations. The two sinks were so small that there was no reserve in time of any consequence, even if the alarms rang the minute the sinks started to fill. Unfortunately, the floor of the store room slopes towards the meter room; had it sloped towards the other door, the overflow would have gone to an existing mechanical sump, although by regulations this sump is not supposed to handle any waste water.

The discharge from each washer is hastened by its own pump and is complete in about 45 seconds. Careless timing of the starting of the washers could bring about a lot of water discharged at the same time. However, there is a practical limit to the number of washers started at one time or within the 45-second time interval, and that is the operator's inability to attend so many in that time. Another cause of flooding can be a house sewer big enough for the building before launderettes were thought of, but not for 20 washers. If there is a good rain at the same time, the waste to sewer might even require a back water valve with

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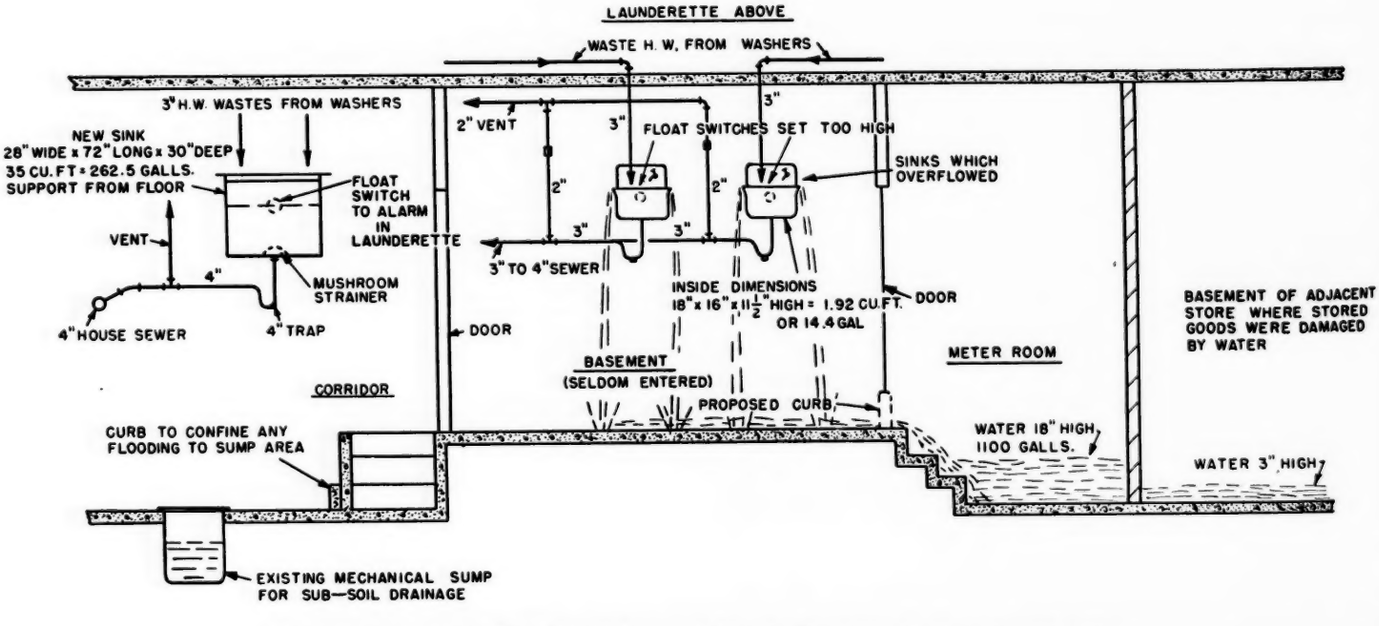
Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.



Arrangement of overflowing sinks providing indirect waste from launderette.

washers shut down or moderated during the rain. A further liability is the clogging of the sink trap with lint and dirt, as well as the strainer placed in the sink to protect the trap. Each washer also has a strainer which is given more or less attention. A final cause is insufficient head of water from sink to sewer to hasten discharge, especially where the flap of a back water valve must be lifted.

Various remedies were proposed by various contractors and engineers. For example, the installation of one sink of much larger size with greater head for its discharge by locating it with top at launderette floor level where any flooding would be immediately noticeable. So it was said, but there was still a possibility, even if remote, of back water during a rain and a non-working day with no one around. There was also a possibility of flooding passing directly through partitions to the next store without passing through the basement. Waterproofing of the base of the partitions would require temporary removal of 12 washers and the installation of the sink would permanently take up the space of one washer, so that this scheme was abandoned.

The next proposal was for a large sink in the same old basement storeroom below, a concrete curb at the door to meter room, the waterproofing of the base of all walls and a mechanical sump in the floor below the sink. This was too expensive, and it was decided to install a large sink, as large as would go in a space over the existing mechanical sump to which it could flood. The flood could also be confined to the sump area by a concrete curb in the event that the sump becomes overburdened from other work or failed to operate from mechanical or electrical defects or current failure. At any rate, flooding would be noticed much more quickly with the sink located in the corridor; furthermore, the sink being deep enough, its float switch could be set quite low.

The launderette has 20 washers, of which 12 are on one 3-inch line, and the balance of 8 are on a second 3-inch line, the entire installation having grown with time and approved before present regulations were in force. Present regulations do not permit direct connection to the sewer—there must be an air gap between. At one time, long ago, these washers were direct connected to the sewer and at that time there were never any troubles.

Regulations require that the waste line from washers be 2 inch up to three washers and 3 inch up to 12, and that this waste line discharge to a slop sink 20 inches x 24 inches x 16 inches deep. Above 12 and up to 30 washers the waste line must be 4 inches and discharge to a slop sink 36 inches x 36 inches x 36 inches deep. The waste line from the sink must be one commercial pipe size larger than the waste line to the sink. These regulations are simply stated and are interesting, but why should 10 washers require a sink of 15-gal capacity while 20 washers require one of 200-gal capacity, and where does one find a slop sink which will take a 4-inch trap? You can't even get such a trap on a hospital fixture.

The usual launderette contains a line of washers on each of its two long walls; in the case under discussion, 12 were on one long wall, the balance of 8 on the other wall. Then, by regulation, each drain line must be 3 inches to a separate 20-inch x 24-inch x 16-inch sink having a 4-inch trap to a 4-inch house sewer, this being the usual size sewer available, in any event. Each 4-inch sink waste can then combine into a 4-inch common waste to a 4-inch house sewer.

Now, suppose that the intent of the regulations rather than their actual wording were lived up to. We would then combine the two 3-inch drain lines into one of 4-inch size and discharge this into a 36-inch x 36-inch x 36-inch sink having over seven times the capacity of the two small slop sinks, and from this large sink would run a 5-inch waste to at least a 5-inch house sewer. Further, why do the regulations call for a sink of 36-inch depth? Why not a sink of the same capacity, but of any suitable depth. Regulations also call for sinks to be water supplied, even though the washer water will always insure the filling of trap seals. Nothing in the regulations say at what elevation the sinks must be, yet the regulations call for them, and so they are there in the installation (see drawing), but who could climb up to operate the faucets.

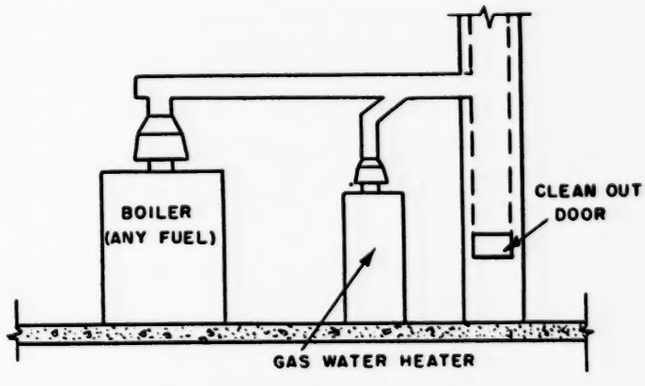
• ONE CHIMNEY FOR TWO HEATERS

Occasionally it becomes necessary to connect a heating boiler and a water heater to the same chimney, the water heater being gas-fired and the boiler burning gas or some other fuel. Gas utilities, underwriters of fire insurance and building codes have requirements in this respect* which in general conform with the comments which follow:

Now it is well known that flue openings to a chimney at the same level when opposite one another block the flow of one or the other. A more desirable arrangement is to right-angle the openings, but the preferred and approved arrangement is one of separate flue openings at different levels. Because the water heater is the smaller appliance, is gas-fired, and runs year-round, it should be favored in every way, located close to the chimney and with flue entering the chimney 10 or 12 inches above the flue from the heating boiler. The boiler, being the larger device will, as a rule,

(Concluded on page 130)

*Two flues to a chimney are not permitted unless the gas appliance is equipped with an automatic device to prevent the escape of unburned gas at the main burners.



One chimney for two heaters.

Performance of a Typical Baseboard Heating System

Following is an abstract of a report of tests at the National Bureau of Standards.

THE use of baseboard heating systems in low-cost housing has increased in recent months, particularly in basementless houses where a first-floor heating system is necessary. In order to acquire adequate technical data on systems of this type, the National Bureau of Standards included an investigation of a typical baseboard heating system as part of its broad program on heat transfer phenomena in small houses. The tests covered the temperature distribution in a four-room test bungalow under various outside temperature conditions, in addition to the installation and operational problems involved. A study of the characteristics of two types of room-temperature controls with such a system was also made. In spite of certain inherent disadvantages—mainly the difficulty of fitting the system to the variable dimensions of conventional houses and the inability to control the heat output to individual rooms—the Bureau's results indicate that the baseboard heating system provides more comfortable environments in dwelling homes than many of the systems used in the past.

The baseboard heating system installed in the test bungalow at the National Bureau of Standards consisted of lengths of finned 1¼-inch iron pipe under the windows connected by unfinned 1-inch standard pipe and partially enclosed by a perforated sheet-metal cover. The fins were 3½ inches square and were spaced ¼-inch apart on the pipe. Heat was transferred primarily by convection of air through the enclosure and over the finned surface. Hence, the system has been termed a baseboard convector system.

Two types of controls were used for the tests: (1) a conventional wall-type electric thermostat and (2) a modulating control employing an outside thermostat and a three-way valve that mixed the boiler supply and return water to vary the temperature of the water entering the system.

The Bureau's test bungalow, which conforms to FHA specifications for a low-cost house, is completely enclosed by an insulated outer shell so that the temperature may be varied to simulate any condition throughout the United States. It is of frame construction and has four rooms and a bath, which are connected by a hallway near the center of the house. There is a full basement under the living quarters, although this feature was not a consideration in the present tests. The outside walls of the structure are of conventional frame construction and consist of 2- by 4-inch studding with sheathing and lap siding on the outside separated by a layer of building paper. The inside wall finish consists of ½-inch plasterboard nailed directly to the studding. A double-wood floor is used with 1-inch rigid insulation nailed directly to the underside of the floor joists. The ceiling of the living quarters is ¼-inch plywood supported by frameworks of 2- by 4-inch members and covered by 3⅝-inch of rock wool insulation.

Temperatures were measured in the test bungalow by means of thermocouples supported by strings attached to the ceiling. Other thermocouples were used to measure the temperatures outside of the bungalow, on the inside and outside surfaces of the exterior walls, on the floor surfaces, in the basement, in the attic, and at several places on the hot water pipe encircling the house.

TABLE 1—TEMPERATURE DISTRIBUTION PRODUCED BY BASEBOARD CONVECTOR WITH ROOM THERMOSTAT
(Inside doors open)

Item	Test Number			
	1	2	3	4
Outside temperature, F.....	49.9	31.6	20.7	4.9
Heat loss of house, Btu/hr..	8,650	16,280	22,410	27,970
Average room temperature:				
2 in. above floor.....	69.2F	68.1F	66.9F	66.0F
30 in. above floor.....	70.2	70.1	69.7	69.4
60 in. above floor.....	70.5	70.5	70.4	70.3
78 in. above floor.....	70.9	71.1	71.0	71.1
94 in. above floor.....	71.3	71.8	71.9	72.0
Vertical temperature difference:				
2 to 60 in. above floor....	1.3	2.4	3.5	4.3
2 to 94 in. above floor....	2.1	3.7	5.0	6.0
Basement temperature	61.7	55.2	50.7	45.9
Attic temperature.....	56.1	46.8	40.5	35.7
Floor surface temperature....	68.0	66.3	64.9	63.3
Wall surface temperature....	66.6	64.1	62.9	60.4

TABLE 2—TEMPERATURE DISTRIBUTION PRODUCED BY BASEBOARD CONVECTOR WITH ROOM THERMOSTAT
(Inside doors closed)

Item	Test Number			
	1	2	3	4
Outside temperature, F.....	49.9	32.1	20.1	0.8
Heat loss of house, Btu/hr..	9,220	16,530	23,020	32,260
Average room temperature:				
2 in. above floor.....	69.0F	67.7F	66.9F	64.8F
30 in. above floor.....	69.9	69.7	69.6	68.4
60 in. above floor.....	70.0	70.1	70.3	69.1
78 in. above floor.....	70.3	70.7	70.9	70.3
94 in. above floor.....	70.7	71.3	71.8	71.0
Vertical temperature difference:				
2 to 60 in. above floor....	1.0	2.4	3.4	4.3
2 to 94 in. above floor....	1.7	3.6	4.9	6.2
Basement temperature	61.3	54.0	49.3	42.9
Attic temperature	55.7	46.6	40.9	32.9
Floor surface temperature....	68.1	66.2	64.5	62.2
Wall surface temperature....	66.6	64.5	62.8	60.3

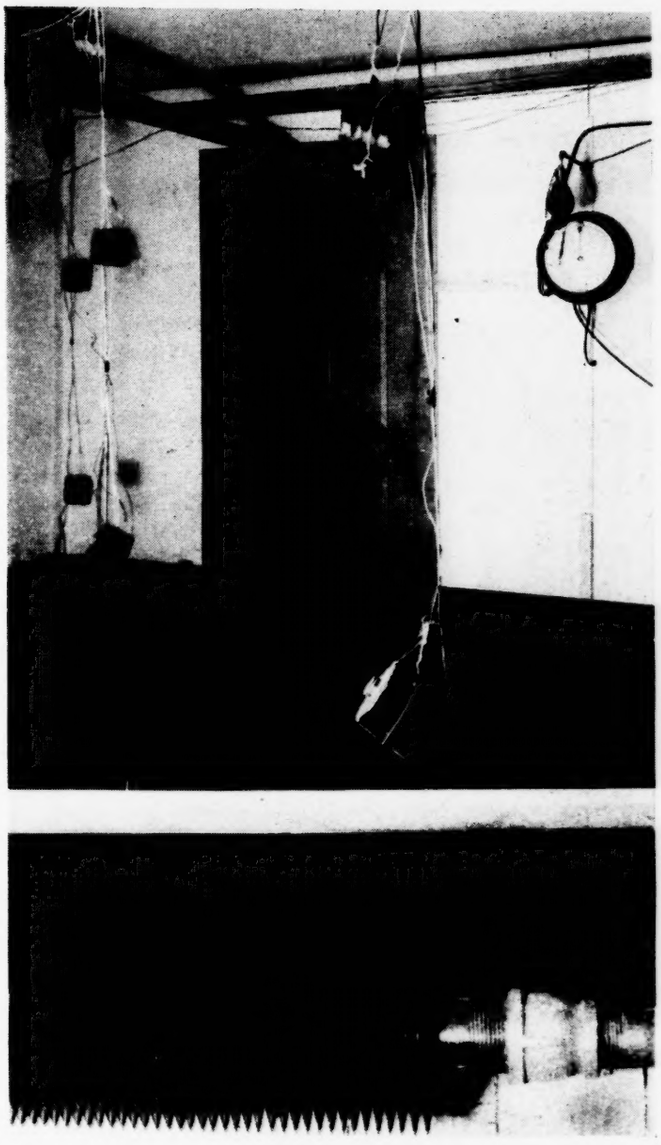
The averages of the temperatures recorded in the test bungalow at each of five levels above the floor are tabulated in Tables 1 and 2 for the tests using the room thermostat control and in Table 3 for the tests using the outside thermostat control. The vertical temperature differences between levels are also shown in these tables.

The test results showed that comparatively small temperature differences existed between rooms and between different levels in the same room with this type heating system for the range of outside temperature from 50F to 0F. However, the temperature differences increased in magnitude both horizontally and vertically as the outside temperature decreased. The vertical temperature gradient ranged from 0.3F per foot above the floor for an outside temperature of 50F to 0.8F per foot for an outside temperature of 0F. A comparison of the results in Table 1 when the interior doors of the bungalow remained open with those in Table 2 when the doors were closed shows that the temperature differences in a vertical direction were not appreciably affected by closing the doors. The maximum temperature difference between any two rooms in the living zone, that is, between 2 and 60 inches above the floor, ranged from 0.7F to 1.4F with the interior doors open and from 1.4F to 3.6F with the interior doors closed for an outside temperature range 50F to 0F.

The heat loss of the test bungalow observed at the different outside temperatures is shown in Tables 1 to 3 for the two methods of heating system control. The heat loss of the structure is shown to be directly proportional to the difference in temperature between the inside air and the outside air, although the heat loss averaged about 5% greater when the interior doors were closed. This greater heat loss when the doors were closed was due primarily to the overheating of the bathroom (used as a utility room).

The control of room temperature by the outdoor thermostat and modulating valve for rapidly changing outdoor temperature was observed. The results show that some overheating of the house occurred during periods of rapidly falling outdoor temperature and that some underheating occurred during periods of rapidly rising outdoor temperatures. This phenomenon was to be expected because the temperature of the supply water was changed immediately in response to counter changes in outdoor temperature, whereas the inside air temperatures did not feel the effect of the outdoor temperature change for an hour or more because of the thermal lag of the exterior walls.

The results of the Bureau's investigation showed that the specimen baseboard convector system produced lower vertical temperature gradients in the test bungalow than any other system or device that had been tested heretofore. Whereas a temperature difference of 8F was observed between the 2-inch and 60-inch levels for a gravity hot water heating system with conventional thin tube radiators and the boiler in the basement, a temperature difference of 3.5F was observed between the same levels with the baseboard convector for an outside temperature of 20F in both cases.



(Top) Instrumentation of test room and (lower) detail of finned section of baseboard piping.

TABLE 3—TEMPERATURE DISTRIBUTION PRODUCED BY BASEBOARD CONVECTOR WITH OUTSIDE THERMOSTAT AND MODULATING VALVE

(Inside doors closed)

Item	Test Number			
	1	2	3	4
Outside temperature, F	50.1	32.0	20.5	0.9
Heat loss of house, Btu/hr.	12,600	19,520	24,750	29,480
Average room temperature:				
2 in. above floor	71.2	70.2	68.5	64.4
30 in. above floor	73.0	72.4	71.2	68.6
60 in. above floor	73.2	72.9	72.0	69.4
78 in. above floor	73.5	73.4	72.8	70.2
94 in. above floor	73.9	74.0	73.5	71.1
Vertical temperature difference:				
2 to 60 in. above floor	2.0	2.7	3.5	5.0
2 to 94 in. above floor	2.7	3.8	5.0	6.7
Basement temperature	52.2	48.9	45.3	42.4
Attic temperature	57.3	47.9	41.2	33.5
Floor surface temperature	69.3	67.7	65.6	62.5
Wall surface temperature	69.4	66.6	64.3	59.5
Average water temperature	128.2	159.2	178.8	191.9

NEWS OF EQUIPMENT AND MATERIALS

McDonnell Make-Up Feeder

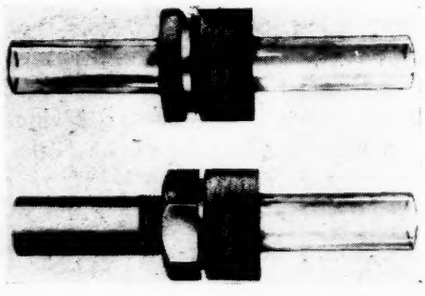
NAME—McDonnell No. 21 make-up water feeder.
PURPOSE — An automatic make-up water feeder to maintain an ade-

quate supply of water in the receiving tank.
FEATURES—The control is mounted on the receiving tank and feeds water directly into the tank. The cam-and-roller straight thrust valve design is said to provide drip-tight closure against water supply pressure up to 150 lb per sq in. Both valve and seat are stainless steel. A large integral strainer is flange-mounted for easy cleaning. Feeder is made with three patterns of mounting flanges so that one will fit opening provided in most receiving tanks.
LITERATURE AVAILABLE—Circular.
MADE BY—*McDonnell & Miller, Inc., Wrigley Bldg., Chicago 11, Ill.*

Item 357

Glass-Pipe Coupling

NAME — Fischer & Porter glass-pipe coupling.
PURPOSE—A threaded metal coupling for use with Pyrex glass pipe lines.

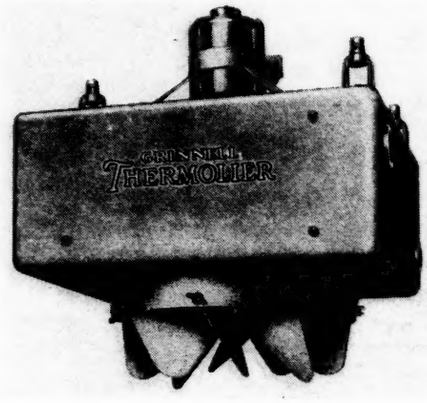


FEATURES—Installation is said to be simplified by replacing three-bolt triangular metal flanges so that the danger due to uneven take-up is eliminated. Makers claim the use of wrenches is no longer necessary and perfect alignment is assured. Metal couplings are available for making layouts with glass-to-glass or glass-to-metal connections.
SIZES AND CAPACITIES—In sizes 1/4, 1/2 and 3/4 inch.
MADE BY—*Fischer & Porter Co., Hatboro, Pa.*

Item 358

Grinnell Heater

NAME—Grinnell Thermolier.
PURPOSE—Unit heater for vertical delivery of heated air from heights above the floor ranging from 9 to 25 ft.
FEATURES—An internal cooling leg



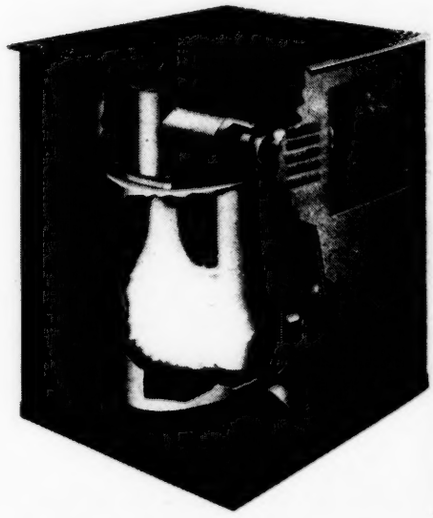
and close connection of a thermostatic trap is said to assure continuous drainage and full heating capacity under all conditions of use. Three-point suspension from adjustable swivel couplings simplify suspension and alignment. Steam supply and return piping connections are on one side for compactness, neatness and economy. A permanent built-in pitch for each individual U tube assures continuous drainage. Permanently bonded individual square fins provide uniform heat transfer. The electric motors for the vertical delivery of this unit are built to specifications and handle fans of special design. Wide spacing of fins minimizes dirt collection. A heavy gage sheet steel housing is provided.
SIZES AND CAPACITIES—Available in six models with heating capacities, on the standard rated basis of 2 lb steam and 60F entering air, from 50,800 to 250,000 Btu per hr.
MADE BY—*Grinnell Company, Inc., 277 W. Exchange St., Providence 1, R. I.*

Item 359

United Air Floor Heater

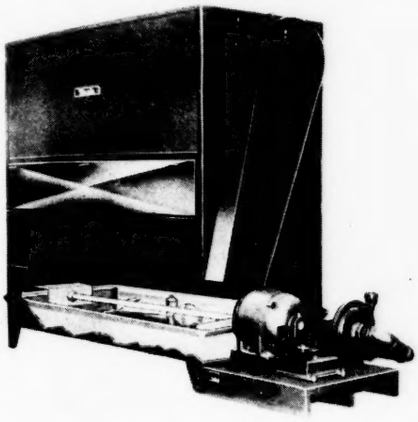
NAME—United Air floor heater.
PURPOSE—Space heating, using oil as fuel.
FEATURES — The down-flame principle is said to permit the burner to be located at the top of the unit immediately below the grille so that danger of injury by heat failure from flood water is eliminated. Since the burner is located at the top, there is easy accessibility to both burner and controls by removing the grille. Controls are shielded against heat. Double inner liners are employed and the heat exchanger is constructed of 12-gage welded steel.
SIZES AND CAPACITIES—Dimensions of required floor opening are 26 x 30 inches with overall depth from floor level to bottom of unit, 36 inches. Output, 45,000 Btu per hr. Corresponding fuel consumption 0.39 gal per hr with No. 2 oil.
MADE BY—*United Air Heaters, Inc., Seattle, Wash.*

Item 360



Lektro-Tektor

NAME—Lektro-Tektor.
PURPOSE—Protective device to prevent corrosion of sump tanks of evaporative condensers and cooling towers.

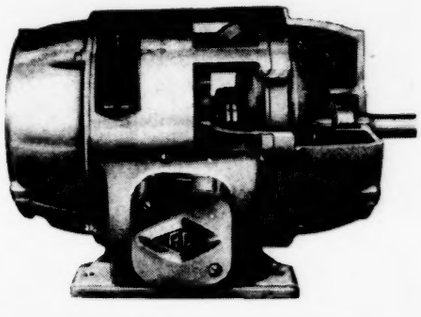


FEATURES—The rod that is used and installed in the sump tanks slightly below water level bears the brunt of the electrolytic corrosive action. Electrons produced by the device are said to flow to the walls of the tank to reduce to a harmless state the dissolved oxygen and other corrosive elements. A protective film is formed on the tank walls as the continuous flow of current results in deposits of insoluble lime salts on such walls. Magnesium, which is introduced into the water from the rod, strengthens the protective film.
MADE BY—*Marlo Coil Co., 6135 Manchester, St. Louis, Mo.*

Item 361

Reuland Motor

NAME—Reuland fluid-shaft electric motor.
PURPOSE—Motor to provide smooth, fluid drive power where an operating load requires smooth acceleration and protection against shocks.

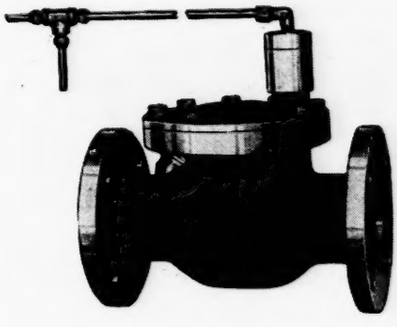


FEATURES—Motor features a single frame, integral design of motor and fluid-drive coupling. The unit utilizes the regular electric motor frames and end bells to eliminate the need for special parts. Starting and operating shocks are absorbed by an oil cushion. Motor is available in standard foot-mounted or round body frames. Motors can be mounted horizontally or vertically or with NEMA flange and face type end bells. Makers say unit requires about same mounting area as the motor alone.
SIZES AND CAPACITIES — ½, ¾, 1, 1½, 2, 3, 5, 7½ and 10 hp.
LITERATURE AVAILABLE — Bulletin R-20.
MADE BY—*Reuland Electric Co., Alhambra, Calif.*

Item 362

Sentry Valve

NAME—Sentry automatic instant-closing shut-off valve.
PURPOSE—To close gas, fuel oil or other hot lines entering a danger area.



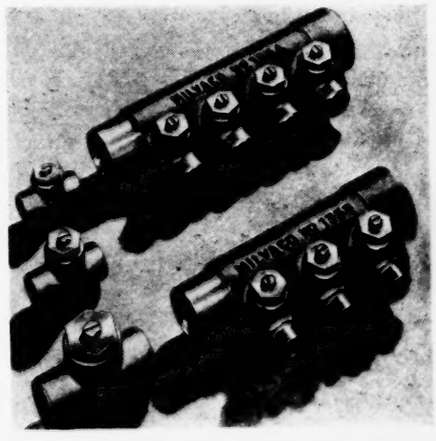
FEATURES—Valve is controlled by a ¼-inch copper tube maintained at a nominal pressure of 5 lb or more, of the air or inert gas supplied through a special fitting with a small orifice. This control line may be extended throughout the plant in loops or multiple runs to any number of locations where fires or other hazardous conditions may exist. Valve is actuated and closes instantly whenever the air pressure in the line is released. Many types of controls, with any desired number of actuating control units on a single control line, may be used to operate one or a series of Sentry valves by providing suitable means to break the seal on the control line when an emergency occurs. Breaking of the seal may be accomplished by the melting of fusible seals, by manual control, by explosion, or through the use of a solenoid as a check against power failure.
LITERATURE AVAILABLE—Bulletin.
SIZES AND CAPACITIES—In ten sizes from ¾ to 8 inches. From 2 inches to 8 inches, unit is provided with flanges; screw type for the smaller sizes.
MADE BY—*McRae Valve Corporation, 620 S. Main St., Los Angeles 14, Calif.*

Item 363

Milvaco Manifold

NAME — Milvaco balancing valve manifold.
PURPOSE — Manifold designed to eliminate the need for extra fittings and joints and to provide a balanced control for radiant heating systems.
FEATURES—Made in units of three and four series for copper tube sweat connections, manifold can accommodate a large number of circuits by combining several units. For example, a 7-valve combination can be obtained by joining a 3- and 4-valve manifold. Valve is constructed of steam bronze.
LITERATURE AVAILABLE—Bulletin.
SIZES AND CAPACITIES—Available in two sizes, 1¼ x ⅜ inch and 1¼ x ½ inch.
MADE BY—*Milwaukee Valve Co., Milwaukee, Wis.*

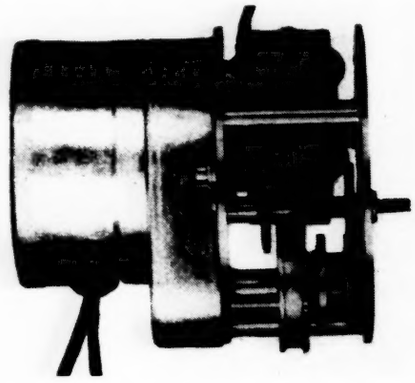
Item 364



Cramer Motor

NAME—Cramer type SXC synchronous motor.

PURPOSE—Motor designed for timing, indicating, and switching ap-



plications requiring an accurate reset operation.

FEATURES—Clutch unit consists of a differential, internal tooth planetary gear system whereby the sun gear is directly coupled to the motor and the planet gears to the output. When locked by energizing an electro-magnet, the internal gear causes the motor to drive the output shaft. When the magnet is de-energized the internal gear is released, breaking the driving couple. The magnet engages the internal gear from a four to one step-off so that the clutching force is one-fourth that normally required if engaged directly. Thirty-nine output speeds are available from 15 rpm to ¼ rpd.

MADE BY—*The R. W. Cramer Co., Inc., Centerbrook, Conn.*

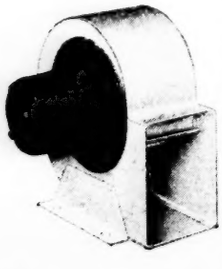
Item 365

Hy-Duty Blower

NAME — Hy-Duty blower, model 5-30.

PURPOSE—Multi-purpose utility blower.

FEATURES—Housing members are press-formed from sheet steel welded into a strong scroll. The venturi ring is deep and is said to be of proper contour for high efficiency. Blower wheel is accurately balanced for quiet operation. Blades are formed singly in presses and double riveted into heavy end rings. Standard unit is direct driven by a 1/30 hp motor, has bottom horizontal discharge, and a collar-adapter, 1 inch wide by 5 inches in diameter, which is attached by welding around the inlet opening for the connection of a duct.



SIZES AND CAPACITIES — At zero static pressure and 1,550 rpm, rating is 240 cfm. At ⅜-inch static pressure and 1,650 rpm, rating is 164 cfm.

MADE BY—*Schwitzer-Cummins Co., Ventilating Div., 1145 E. 22nd St., Indianapolis 7, Ind.*

Item 366

Carrier Cube Maker

NAME—Carrier automatic ice cube maker.

PURPOSE—Automatic production of ice cubes.

FEATURES — Machine is available for either 115- or 230-volt, 60-cycle a-c, and means are provided for connections with water supply and drain. Unit uses a ¾ hp hermetic compressor capable of delivering 8,500 cubes, or 410 lb of ice every 24 hr. It operates on an approximately ½ hr freeezing cycle. Makers have eliminated the need for a flotation device to release the cubes. Bin stores 160 lb of cubes, or the results of eight hours production. An alternate bin of 240 lb storage capacity is also available. When unit is operating it automatically delivers ice until the bin is full. Operation then ceases until such time ice as is removed from the bin and additional cubes are required.

OPERATION—Water is sprayed down the inside of stainless steel tubes. Ice builds up on the inside walls of these tubes and when a cube has built up to a thickness that prevents the water from flowing through, automatic controls reverse the cycle so that hot refrigerant gas is circulated through attached copper tubes to release the ice formed. This cycle repeats automatically until the storage bin is full.

MADE BY — *Carrier Corporation, Syracuse, N. Y.*

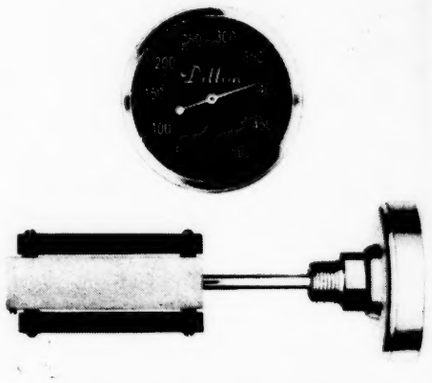
Item 367

Dillon Thermometer

NAME—Dillon flat stem, magnetic thermometer.

PURPOSE — Temperature measurement.

FEATURES — The large flat area is said to gather heat quickly and to retain heat from the surface under test. Magnets enable the operator to place the thermometer on a flat surface, thereby eliminating special fittings. Unit is constructed of 18-8 stainless steel. Figures on the dial are anodized black against silver background and instrument is said to be accurate to within 1% of the full scale reading. Crystal is sealed with double gaskets to make it moisture proof. No gears or linkages are used in the instrument.



SIZES AND CAPACITIES — Available with either Fahrenheit or Centigrade markings and in nine different ranges—0 to 200F, 50 to 300F, 50 to 500F, 150 to 750F, 200 to 1000F, 0 to 100C, —10 to 110C, 0 to 150C, and 0 to 300C. Stem can be obtained in lengths from 3 to 42 inches.

MADE BY — *W. C. Dillon & Company, Inc., 5410 W. Harrison St., Chicago 44, Ill.*

Item 368

Aerodyne Filter

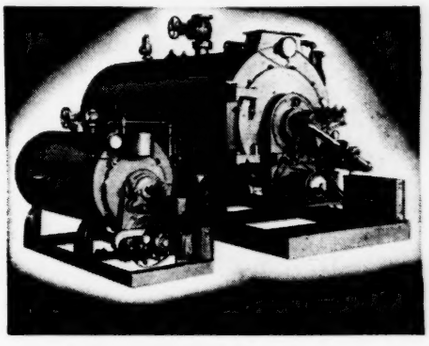
NAME—Aerodyne type CC filter.
PURPOSE—Centrifugal collector for removing dust particles from air or gas.
FEATURES—Unit consists of two or

more cone-shaped elements of laminated plates. A suction fan, placed behind the collector, draws the dust-carrying gas through the inlet into the first conical element. The gas passes through the laminated surface and then through the second element for final cleaning. Dust particles are kept in continuous motion by the gas flow inside and clean air escapes. The concentrated dust mixture in the secondary circuit passes through a small collector for precipitation. This secondary gas is returned to the cone inlet and the cycle is repeated. The collector is designed with either vertical or horizontal elements. Inspection doors are provided with locking devices.
LITERATURE AVAILABLE—Bulletin.
MADE BY — *Aerodyne Corp., 901 Leader Building, Cleveland 14, Ohio.*

Item 369

Cyclotherm Boiler

NAME — Cyclotherm steam generator.
PURPOSE—Packaged type of steam generator to permit interchangeable oil or gas firing without requiring a change of nozzle.
FEATURES—New models include a simplified air supply system, improved combustion and ignition programming controls, and a blower air channel design for quiet operation. Operating sounds of new models have been reduced to well below 45 decibels. Quiet operation has been obtained by the use of sound reducing materials in critical points and by modifiers in the air channel. Makers claim an 80% efficiency with oil, gas or with a combination burner for oil or gas. Unit is delivered completely ready for operation and the contractor is only required to spot the unit, and to make connections to fuel, electricity, water, steam and flue lines. Six oil grades can be used. Steam generation is completely shut down when steam demand is satisfied and automatically started when steam pressure is again required. On units from 80 to 300 hp, modulating control of firing provides for operation at any level between 30% to 45% and 100% of rated capacity. Protection is assured by automatically timed sequence firing and in the event of any electronic compo-

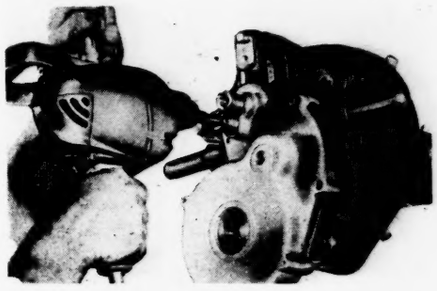


nent failure, the unit is designed to fail safe.
SIZES AND CAPACITIES—From 10 to 300 hp and pressures from 15 to 200 lb per sq in.
LITERATURE AVAILABLE — Bulletin P-1.
MADE BY—*Cyclotherm Corp., Dept. 11R, 90 Broad St., New York 4, N. Y.*

Item 370

Porta-Drive Threader

NAME—Porta-Drive.
PURPOSE—Electrically driven portable pipe threader.
FEATURES—Unit is driven by a ½ hp heavy duty electric drill and attaches to any standard set of dies by especially designed adapter yokes. Unit has a 20 to 1 gear reduction. An aluminum casing houses a bull gear and cold rolled spur gears, all sealed in grease.



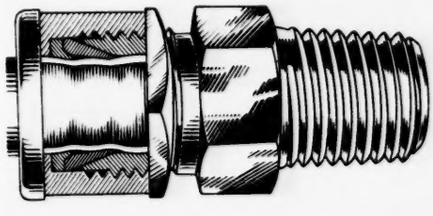
Unit threads pipe easily and, after the threading has been completed, insertion of the drilled head into a reverse drive socket permits removal of the die.
SIZES AND CAPACITIES—For threading pipe up to 6 inches in diameter. Weight, 14 lb.
MADE BY—*Muncie Gear Works, Inc., Muncie, Ind.*

Item 371

Crawford Fitting

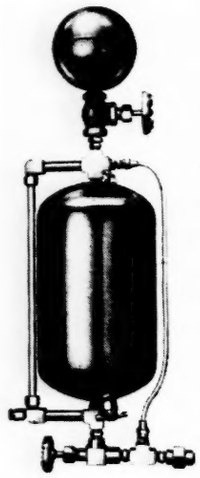
NAME—Swagelok.
PURPOSE—To provide a seal and axial support for use with metal or plastic tubes.
FEATURES—Unit consists of two ferrules and a threaded chuck clamp. No flaring is required with its use. Unit is slipped onto the end of a tube and then given one and one-quarter turns with a wrench. Makers claim no damaging torque or twisting is transmitted to the tube during the tightening operation.
SIZES AND CAPACITIES — Made in brass, aluminum, steel, Monel and stainless steel, types 303 and 313, and in sizes to accommodate tubes of ⅛ to 1 inch O.D.
MADE BY—*Crawford Fitting Co., Cleveland 17, Ohio.*

Item 372



Water Treatment

NAME—Copper-Hide regulator.
PURPOSE—For treating water to remove some of the effects of water hardness.
FEATURES—The unit feeds Aqua-Treat by gravity, a heavier-than-water concentrate for locking up and making inert the hardness elements in the water. The chemical used is sodium polyphosphate. The regulator controls the amount of concentrate desired.

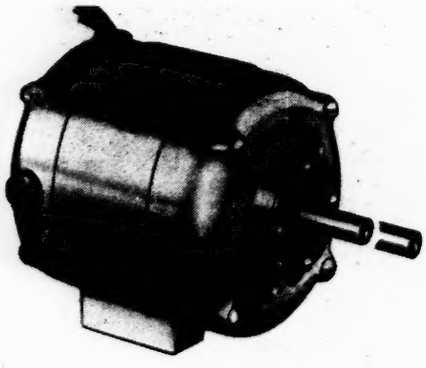


OPERATION—When a tap in the water line is opened to release hot water, a release of pressure provides a forward surge so that a slug of the water treatment is flushed into the hot water tank. The equalizer line in the copper tubing keeps in balance the pressure in the system with the pressure in the regulator. This treatment is for the hot water line only.
SIZES AND CAPACITIES—Available in three sizes—2½-, 5- and 10-quart sizes. One gallon of Aqua-Treat can handle 4,000 gal of water.
MADE BY—*Roberts Steam Specialty Co., 5323 Stanard Ave., Cleveland, Ohio.*

Item 373

EMC Motor

NAME—EMC model 700 motor.
PURPOSE—For general use requiring a fractional horsepower motor.

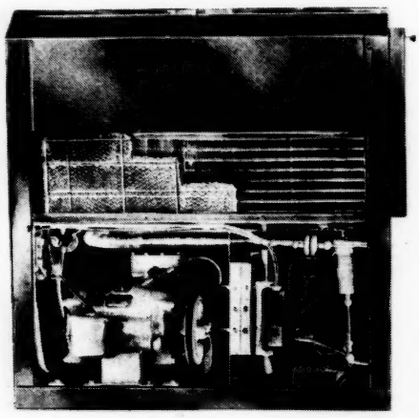


FEATURES—Motor can be supplied wound for the exact power a product needs, from 1/15 to ½ hp for continuous duty, or ¾ hp for intermittent use. When shunt wound, motor has an intermittent-duty rating of ½ hp. Motor can be wound for voltages from 6 to 230, d-c or a-c. Housing can be ventilated or can be supplied totally enclosed. Standard shaft diameter is ⅜ inch, and motor can be supplied with a wide variety of shaft lengths. Two types of bearings are available—grease-sealed ball and porous bronze sleeve. An internal fan is included for cooling.
MADE BY—*Electric Motor Co., Div. of Howard Industries, Inc., Racine, Wis.*

Item 374

Remington Room Conditioner

NAME—Remington Aristocrat, models 10M and 12M.



PURPOSE—Room air conditioner for shipboard use.
FEATURES—Unit is water-cooled and has a separate ventilating blower which, for best results, should be connected to a source of outside ventilating air. The compressor is of the two-cylinder type with a speed of 1,020 rpm. Condenser is of the counter flow type, has nickel alloy tubes which are adaptable for sea water use, a safety switch that stops the unit if the water supply fails. A drip-proof motor, designed for marine service, is used and can be supplied for standard d-c or a-c current of 25, 40, 50 or 60 cycles and 208 or 230 volts. Motor is 1½ hp. A humidity control, which can be adjusted by turning a knob, provides increased air drying for humid seasons or increased air cooling for hot dry climates. Freon-12 is used as the refrigerant. Water and drain connections are located at the rear of the unit.
SIZES AND CAPACITIES—Under normal operating conditions, 13,700 to 15,000 Btu per hr. Unit removes up to 51 quarts of water from the conditioned air daily.
LITERATURE AVAILABLE—Circular.
MADE BY—*Remington Air Conditioning Div., Remington Corporation, Cortland, N. Y.*

Item 375

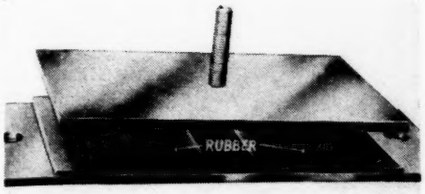
Rockbestos Heating Cable

NAME—Rockbestos electric heating cable.
PURPOSE—Electric heating cable, supplied as kit, to be installed on roofs to prevent icing of gutters.
FEATURES—Kit contains 60 ft of lead-sheathed heating cable complete with standard plug, shingle clamps for attaching the cable to the roof, and installation instructions. The cable is looped around the edge of the roof to melt channels through the ice so as to permit water to drain away normally and thus avoid a mass of ice that could possibly damage gutters. The cable is rated at 460 watts and is designed for operation from 110 to 120 volts. One kit is said to be sufficient to protect from 18 to 20 ft of roof.
LITERATURE AVAILABLE—Folder.
MADE BY—*Rockbestos Products Corp., New Haven 4, Conn.*

Item 376

Finnflex Mount

NAME — Finnflex CM-H vibration mount.
PURPOSE—Mount to isolate machinery vibration.
FEATURES—The mount consists of

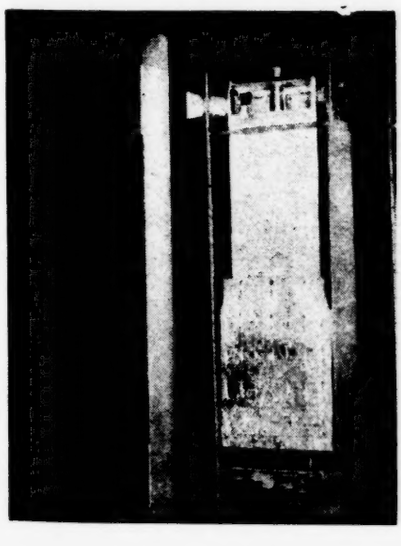


a specially designed steel channel floated in rubber between two steel angles. A correct angularity between the steel parts and the rubber securely bonded thereto, enables the unit to approximate the flat spot on a stress-strain curve of relative slope. Each unit is drilled and tapped ready for use.
SIZES AND CAPACITIES — Overall height, 2 inches. Load range from 600 to 10,000 lb.
MADE BY—*Finn & Company, 2850 Eighth Ave., New York 30, N. Y.*

Item 377

Royal Jet-Flow

NAME—Royal Jet-Flow heater.
PURPOSE—Space heating in homes.
FEATURES—By using the jet principle, 300 fpm velocity is used to throw heat to all parts of the average size home. Air is taken in at registers located at floor level and passed over the heating element into a cone shaped duct. As the heated air is compacted in the stack its velocity increases, and when it leaves the register, located just below the ceiling level, it is traveling at the rate of 300 fpm. Hot air may be discharged in any two, three or four directions. Firebox is constructed of low alloy, high tensile steel. A corrugated firebox is used, designed to eliminate noises due to expansion and contraction. Unit is designed to burn natural, manufactured or L.P. gas. Should burner or pilot go out, gas is cut off automatically. Unit is shipped complete in one package with register attached.



SIZES AND CAPACITIES — Available in units of 25,000, 35,000, 45,000 and 55,000 Btu input. Floor space required by the two largest units measures 10⅜ x 27⅜ inches. Other size, 10⅜ x 21 inches.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Royal Heaters, Inc., 1024 Westminster Ave., Alhambra, Calif.*

Item 378

Tenney Convector

NAME—Tenney convector.
PURPOSE—Space heating.
FEATURES — Convector is of the

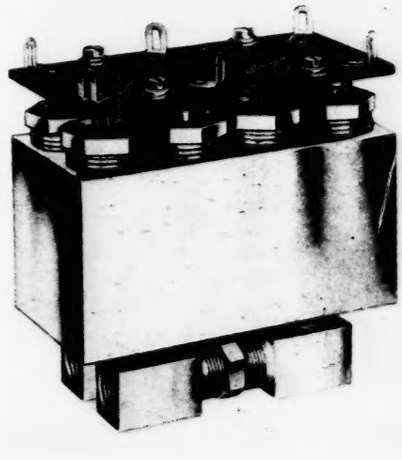
cabinet type and is made in both the recessed type for under window mounting, and the free standing type. Cabinet is made in two sections so that the front can be removed for quick access to the heating element which is made of ⅝ inch O.D. copper tube with facetized aluminum fins. These fins are machine bonded to the tubes. A 1⅜ inch O.D. copper header is placed at each end of the heating element. Supports for the heating element are designed so that a maximum pitch of ½ inch in either direction can be obtained.
SIZES AND CAPACITIES—From 20 x 16 inches to 20 x 62 inches for recess or free standing type. All sizes in both types have a total depth of 6 inches. Capacities for hot water range from 2,000 to 8,900 Btu per hr with 185F water. For steam, the range is from 11 to 62 EDR with steam at 215F and air at 65F.
MADE BY — *Tenney Engineering, Inc., 26 Avenue B, Newark 4, N. J.*

Item 379

Gas Analysis Instrument

NAME—Gow-Mac type M gas analysis instrument.
PURPOSE — Thermal conductivity unit for low cost gas analysis.
FEATURES—Makers claim that the signal produced is comparable to that originating with thermocouples. It can be incorporated into pyrometer circuits with only slight changes and recalibration. Several models are available; the one illustrated has an 8-filament bridge with double output which is said to be satisfactory for sensitive recording and control circuits. In gas-air tests, unit has an output of 1.70 millivolts for 1% CO_2 in air and 11.8 millivolts for 1% H_2 in air. Instrument is said to provide an accurate and low cost method of observing gases for purity or quantitative changes in gas mixtures, under advanced, atmospheric or partial pressures.
MADE BY — *Gow-Mac Instrument Co., 22 Lawrence St., Newark 5, N. J.*

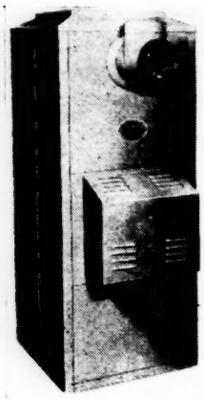
Item 380



Majestic Utility Furnace

NAME — Majestic utility furnace, model UF-26.

PURPOSE — Furnace with facilities for easy changeover from fuel oil to gas operation.



FEATURES — Oil-burning or gas-burning unit is mounted on a steel drawer plate so that all that is necessary to make a change is to pull out the old unit, slide in the new, and make the necessary connections for fuel and thermostat and power line. Unit is shipped in two crates—one for the furnace and one for the burner. Two large cleanouts are reached by removing two screws and the smoke pipe. A simple, terminal board is installed to ease the wiring problem. Design is such that all parts of the furnace are said to be accessible without removing the furnace casing. Cold air returns are available either at the side or bottom of unit. Channelled circulating air cools the casing and is said to increase efficiency. A special filter base is provided where return air is taken from under the floor. Burner and smoke pipe are located on the front to facilitate installation.

SIZES AND CAPACITIES—Bonnet rating of 100,000 Btu per hr.

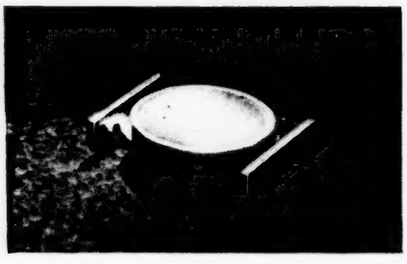
MADE BY—*The Majestic Company, Huntington, Ind.*

Item 381

Thermostat Control

NAME—Thermostat control Type M.

PURPOSE—A compact, quick make and break thermostat for close temperature control of electronic and industrial apparatus.



FEATURES—Unit employs a bi-metal thermal element of disc construction. Close temperature control is said to result from electrical independence of the bi-metal element. Built with a variety of terminal arrangements, the thermostats operate on relatively small differentials. The maximum operating temperature is 600F although the makers claim that low temperatures do not impair normal operation. Two styles of thermostats are available—standard closure for normal operation and hermetically sealed for special applications.

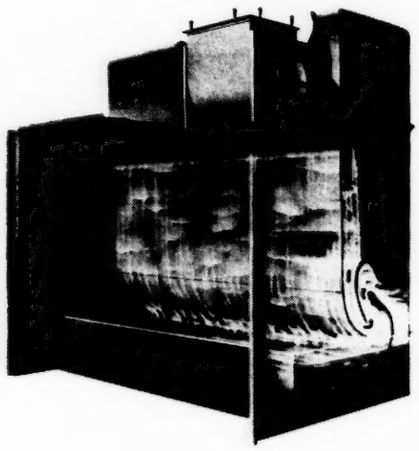
MADE BY—*Stevens Manufacturing Co., Inc., Mansfield, Ohio.*

Item 382

Roto-Wash Spray Booth

NAME—Roto-Wash spray booth.

PURPOSE — Pre-assembled paint spray booth to provide suction of paint-laden air at both the top and bottom of the water curtain.



FEATURES—The hinged flood sheet permits access to the area in back of the water curtain. At the rear of the booth are large doors with free access to the rear of the unit and to the water tank. The service box includes all working parts of the booth with the exception of the fan and fan motor. Pump, screens, float valve, over-flow and drain couplings are mounted in the box for centralized service. This box can be mounted at the side or at the rear of the booth. Since the opened reservoir at the top of the water curtain is the sole source of water in the booth, only one water pipe is required. Pumps operate at a 17- to 20-ft head and are connected to electric motors operating at 1,750 rpm. The 3-inch fan has a capacity of 5,000 to 15,000 cfm, depending on the size of the spray booth.

LITERATURE AVAILABLE — Bulletin 4938-A.

SIZES AND CAPACITIES — Available in five sizes with nominal unit capacities of 5,000, 7,500, 10,000, 12,500, and 15,000 cfm.

MADE BY — *Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.*

Item 383

Midget Relay

NAME—Bulletin 110 midget magnetic relay.

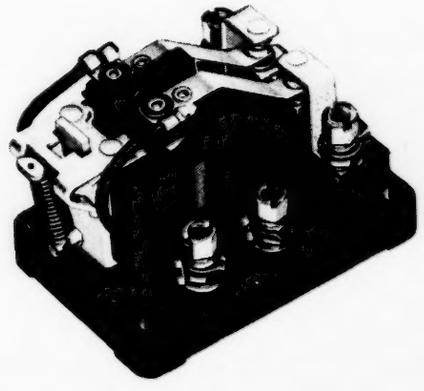
PURPOSE—Small relay designed for use with heaters and similar controls.

FEATURES—Standard two- or three-pole double throw relays have molded phenolic insulating bases, screw terminals for front connection, and heavy silver-to-silver contacts. Leads from movable leaf spring contact fingers to terminals are insulated with Fiberglas tubing. Relays can be supplied with plug-in type bases for mounting in receptacles.

SIZES AND CAPACITIES—For operation on all standard voltages and frequencies up to 115 volts a-c or d-c. Non-inductive ratings for n.o. and n.c. contacts are 10 amps, 24 volts d-c or 115 volts a-c, 60 cycles.

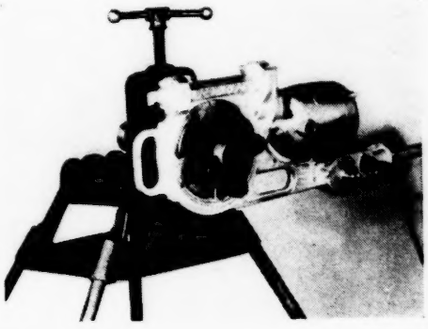
MADE BY—*Ward Leonard Electric Co., Mt. Vernon, N. Y.*

Item 384



Port-A-Pony Threader

NAME—Port-A-Pony.
PURPOSE — Portable pipe threader operated by an electric motor.

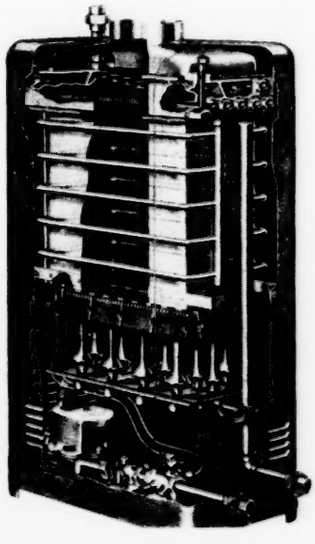


FEATURES—Unit, which weighs only 26 lb, is designed to be carried to the job and to be operated by one person. Motor is ½ hp, 60-cycle, 110 volts, single phase, forward and reverse, operating on either a-c or d-c. Adapters are provided for six popular hand stocks. Dies rotate on the pipe itself to permit threading of pipe already in place. Capacity of the tool is from ½- to 2-inch pipe.
MADE BY—*Thread-Ezy Mfg. Co., Corunna, Mich.*
DISTRIBUTED BY—*Ter-I-Day Sales Co., 18426 Grand River, Detroit 23, Mich.*

Item 385

Ruudiator Boiler

NAME—Ruudiator gas-fired boiler, No. 1067.
PURPOSE—Space heating using gas as fuel.

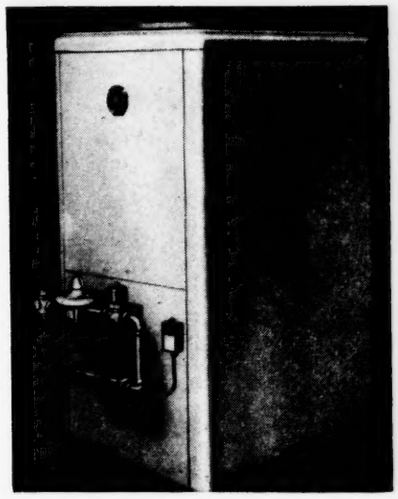


FEATURES—Boiler operates on all types of forced-flow hot water heating and with natural, mixed or manufactured gas. Waterways are made of copper and bronze. Small water content of 1.44 gal and the integral finned tubes are said to provide a unit of high efficiency. There are 17 main burners, each consisting of two cast iron pieces. All burners are drilled for the specific gas to be used. Boiler is factory-assembled with all controls enclosed so that the unit, which weighs 150 lb, can be installed in a small space. Boiler is designed for operating with a circulating pump which is furnished or not, at the buyer's option. A thermomagnetic gas cut-off is used to shut off gas flow if the pilot flame goes out. A hot water high limit control is adjustable to a range of 100 to 240F. Water flows through copper preheating coils bonded to the combustion box, thence through the heat exchanger section, consisting of a series of copper finned tubes. The fins are spirally extruded from the tube so that there is no joint between the tubes and fins.
SIZES AND CAPACITIES—Output rating, 160,000 Btu per hr. Size, 45 x 26 x 14½ inches.
LITERATURE AVAILABLE—Circular.
MADE BY—*Ruud Manufacturing Co., Pittsburgh 1, Pa.*

Item 386

Meyer Furnace

NAME—Meyer Q75G furnace.
PURPOSE—Gravity gas-fired furnace for small house heating.
FEATURES—Unit is designed to provide automatic gas heating for small homes for use with all gases, including LP gas and for both low and high altitude operation. A large heavy steel heating element is used to provide long indirect heat travel and a large area of heating surface. Combustion gases are forced through long vertical flues and must pass around baffles in the radiator. The gas burner has an air shutter and venturi design to provide high gas burner performance. Burner develops a flame pattern which fits the square shape of the main combustion drum so that all parts are heated to approximately the same temperature.
SIZES AND CAPACITIES—Input of 75,000 Btu per hr and output at bonnet of 56,250 Btu per hr.



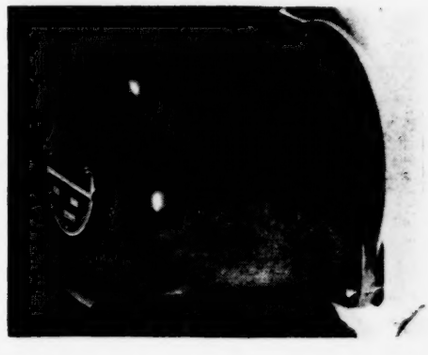
MADE BY—*The Meyer Furnace Co., Peoria, Ill.*

Item 387

Nu-Way Motor

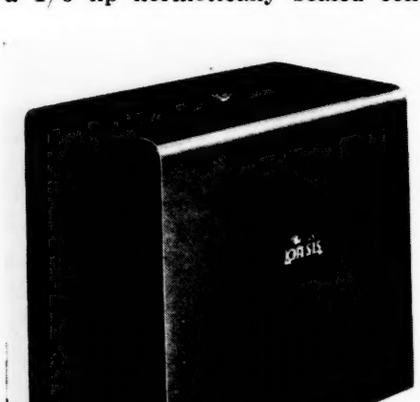
NAME—Nu-Way fractional horsepower motor.
PURPOSE—Motor designed to meet requirements of oil burner service.
FEATURES—Motor has permanently lubricated ball bearings. A removable cover was designed to allow enclosure of the thermal cut-out switch in the housing. The magnetic starting switch is accessible by removing a plate held in place by two screws. The reset button is centered in the end plate. Motor housing and end bells are of sand cast aluminum.
SIZES AND CAPACITIES—[illegible] hp operating at 1725 rpm.
MADE BY — *The Nu-Way Corporation, Rock Island, Ill.*

Item 388



Oasis Air Drier

NAME—Oasis air drier.
PURPOSE—To remove excess moisture from closets or basements.
FEATURES—Drier is equipped with a 1/6 hp hermetically sealed con-

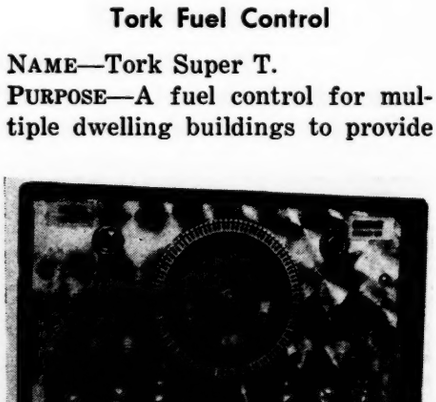


densing unit and operates on 110-volt, 50- to 60-cycle a-c. A galvanized container is provided for collecting the water, or a garden hose can be used for draining off this collected moisture. Under average conditions, makers claim three gallons of moisture will be removed daily.
SIZES AND CAPACITIES — Weight, 100 lb. Measures 12½ inches wide, 20 inches high and 21¾ inches long.
MADE BY—*The Ebco Manufacturing Co., 401 W. Town St., Columbus 8, Ohio.*

Item 389

Tork Fuel Control

NAME—Tork Super T.
PURPOSE—A fuel control for multiple dwelling buildings to provide

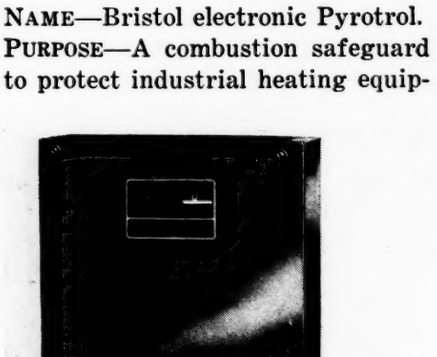


automatic operation of light or heavy oil burners.
FEATURES—Outside temperature recorded by the outdoor head of this unit plus heat losses of the building determine the on and off action of this control. Outdoor head or control is easily adjustable to stop system when outside temperature reaches 55F or any other desired temperature. This head is installed outdoors, preferably in the shade, while the main unit is mounted in the boiler room. Both come in easy-to-padlock cases. Time delay between firing periods ranges from 5 to 55 min., depending on inside and outside conditions. Control operates on 115 or 220 volts, 60 cycles, a-c.
MADE BY — *Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.*

Item 390

Bristol Pyrotrol

NAME—Bristol electronic Pyrotrol.
PURPOSE—A combustion safeguard to protect industrial heating equip-

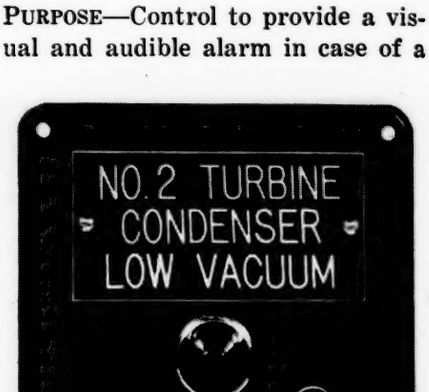


ment from danger of gas explosions and shut-off.
FEATURES—If the normal operation fails at any step, the lighting-up cycle stops and closes any valve that has been opened. Should, at any time, power supply fail, the entire system is shut down in a safe manner. Unit shuts off the gas, lights signals, sounds alarms, and makes relighting impossible if any tube or relay in the unit fails to function in its normal manner. Control uses BX or coaxial cable for connecting flame electrode to the instrument. It is provided with a safe-start relay to prevent gas flow to the appliance should there be a leakage path in the electrode heat or cable. It avoids unnecessary shutdowns due to momentary flame flicker. Available in six models for various requirements.
LITERATURE AVAILABLE — Bulletin W1816.
MADE BY — *The Bristol Company, Waterbury 91, Conn.*

Item 391

Unit Alarm Meter

NAME—Unit alarm meter, type MC-100.
PURPOSE—Control to provide a visual and audible alarm in case of a

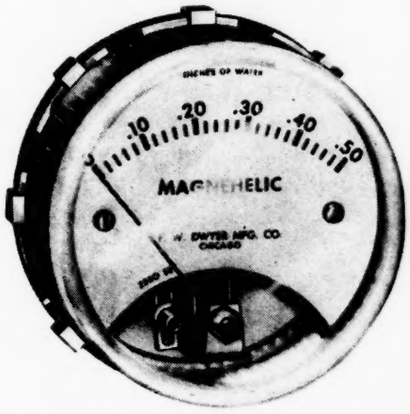


trouble signal from a remote location.
FEATURES—Meter body is made of plastic. Electrical parts are mounted on the back of the meter faceplate and are enclosed by a back cover. Projecting through the lower half of the meter face is a red signal light, a push button switch, and a fuse holder. Both the light bulb and the fuse can be replaced from the front of the meter. Unit can be replaced in circuit without disturbing other parts. While all units in the system may be wired to the same horn, silencing the horn from one alarm meter does not prevent another alarm unit from using the same signal. Unit is designed for use with 115-volt, 60-cycle power. Other voltages and frequencies can be easily manufactured on special order.
MADE BY—*The Unit Alarm Company, P.O. Box 727, Elizabethton, Tenn.*

Item 392

Dwyer Gage

NAME—Magnehelic gage.
PURPOSE—Measurement of air pressure.
FEATURES—Gage has a flexible diaphragm supported by a cantilever



spring which carries a magnet actuating the pointer assembly. Vertical motion of the diaphragm is transformed to rotary pointer motion by means of a helical magnetic linkage. Makers claim that motions of the magnet as small as .00025 inch are reflected in minute movements of the pointer. Plus, minus and differential readings are available. Less than atmospheric pressures are connected below the diaphragm, and those above atmospheric pressures are connected above the diaphragm.
SIZES AND CAPACITIES — From 0.5 to 12 inches of water.
MADE BY—*F. W. Dwyer Mfg. Co., 317 S. Western Ave., Chicago, Ill.*

Item 393

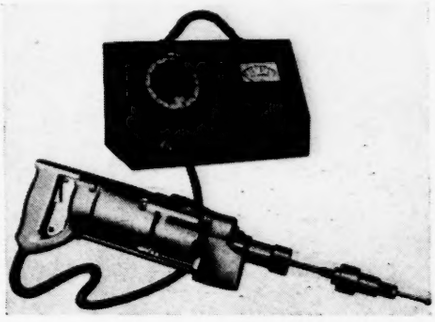
B Resin Coating

NAME—B resin solution.
PURPOSE—A semi-thermoplastic and semi-thermosetting ready-mixed resin to provide a corrosion-resisting coating.
FEATURES—Coating is said to be resistant to concentrated acid solutions. With certain chemicals, coating may soften and swell but it does not dissolve. The solution will adhere to wood, rubber, carbon and similar materials, although for steel and concrete a primer coating is required. A special form of the solution is available for spraying. One gallon of solution will provide a coating 5 to 6 mils over 90 sq ft of surface. For immersion in mixtures of acids and solvents, a thickness of 8 to 12 mils is required.
MADE BY—*Carboline Co., 7603 Forsythe Blvd., St. Louis 5, Mo.*

Item 394

Airetool Roller

NAME — Airetool - Fisher electric tube rolling control.
PURPOSE—Tube rolling device with control to avoid over-expanding of tube.
FEATURES—Device consists of an electric expander driving motor and either a G-800 or G-1200 ball bearing type condenser and heat exchanger tube expander. It uses 110-volt, 60-cycle current, but can also be obtained for use with d-c. In operation, the dial is turned to the setting best for the type of



metal to be rolled. When the maximum torque is reached, the control automatically cuts off power, the motor reverses, and the operator may then withdraw the expander.
MADE BY—*Airetool Manufacturing Co. 307 S. Center St., Springfield, Ohio.*

Item 395

Plug Valve Lubricant

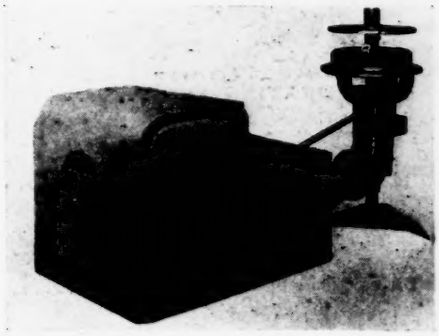
NAME—Hypermatic.
PURPOSE — Lubricant for use in pressurized plug valves carrying oil, water, gas or chemicals.
FEATURES—Makers claim that lubricant is both compressible and expansible and embodies dynamic properties to permit the storage of energy for prolonged periods. Should a lubricated plug valve develop a leak, the automatic force-feed action is said to instantly seal the void. Lubricant is used to maintain a film on the unexposed seat; to form a pressurized seal around each port, and to act as a means of raising the plug slightly off its seat if the plug ever becomes hard to turn. Lubricant is introduced into the valve through a hole in the shank of the plug. Sticks of lubricant are dropped into this hole and a lubricant screw is employed which, when turned, exerts hydraulic force to transmit the lubricant through the necessary channels.
MADE BY—*Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.*

Item 396

Conco Gas Burner

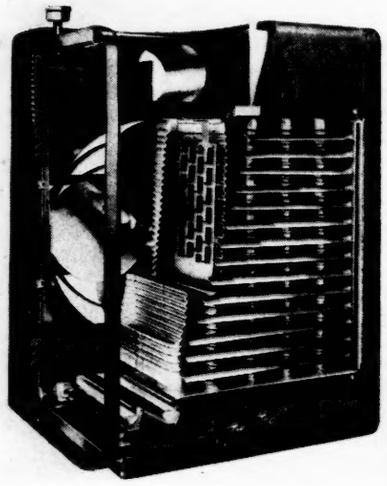
NAME—Conco Monoflame burner.
PURPOSE — Conversion type gas burner.
FEATURES — Burner is fully packaged and wired ready for operation once it is installed. Burner employs a spreader-type flame which adapts the burner to a wide range of installations. It has a telescoping venturi mixer which provides flexible adjustment of air box in relation to heating plant. An adjustable iris orifice applies the camera shutter principle for easy adjustment of gas flow. Burner has an automatic pilot to assure safe operation, and a push button pilot lighter. Electric controls include solenoid gas valve thermostat and limit control.
SIZES AND CAPACITIES—Available in de luxe and standard models with an input range from 60,000 to 210,000 Btu.
MADE BY — *Conco Engineering Works, Mendota, Ill.*

Item 397



Janitrol Heater

NAME—Janitrol unit heater, series UBS.
PURPOSE—Space heating for commercial establishments.



FEATURES—Unit has a new type cartridge ribbon burner which is said to weigh only 30% as much as the standard type of cast iron burner. Multi-thermex steel tube heating assembly units are used. It is claimed that these units have speedier thermal response compared to cast iron. With the steel ribbon burner, only a change of the ribbon bundle is required when the type of fuel gas is changed or when the unit requires service. Makers claim a new type of steel cold rolling process is used to produce the steel tubes for the heat exchanger. Approved by the AGA and Underwriters' Laboratories, heaters may be used for natural, manufactured, mixed and L.P. gases. Safety features include an automatic pilot employing a new actuating lever and switch design, together with a combination fan and limit control to prevent overheating.
SIZES AND CAPACITIES—From 50,000 to 225,000 Btu per hour input.
MADE BY — *Surface Combustion Corp., Toledo 1, Ohio.*

Item 398

Comforteer Heater

NAME—Inland Comforteer, No. 218.
PURPOSE—Space heater using gas.
FEATURES—The fixed orifice in the brass valve automatically regulates the flow of fuel to the burner for proper combustion. Four orifice caps are furnished with each heater.

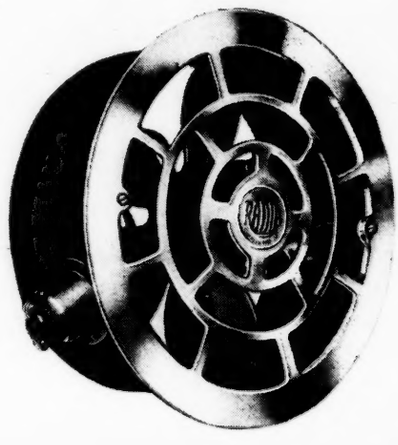
One for each of the following type gases: natural, manufactured, mixed, and L.P. bottled. Double clay radiants are used for increased radiation. A cast iron burner of slotted raised port design is said to have a long life and holds the flame over wide variations in gas pressure. Air shutter is accessible outside of the heater.
SIZES AND CAPACITIES—Input rating of 18,000 Btu per hr. Size, 10 inches deep, 16 inches wide and 18½ inches high.
MADE BY—*Inland Steel Container Co., 325 N. Cortez St., New Orleans 19, La.*

Item 399

Shepler Fan

NAME—Radia No. 1.
PURPOSE — Automatic ventilating fan for built-in installation in small rooms.
FEATURES — The totally enclosed, self-aligning fan motor is provided with an 8-inch Torrington propeller fan. A Redmond four-shaded pole induction type motor with self lubricating bronze bearings is used. This motor operates at a speed of less than 1,500 rpm and is of the non-radio interfering type. Motor and fan assembly is attached to the grille so that the removal of the entire working unit is simplified. Double automatic shutters and weathertight seal prevent back drafts and sweating. Control is through a regular wall switch or a special 3-speed switch. Unit can displace 500 cfm.
MADE BY—*Shepler Mfg. Co., 1312 Sheffield St., Pittsburgh 12, Pa.*

Item 400



OCTOBER, 1949

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

357	358	359	360	361	362	363	364	365
366	367	368	369	370	371	372	373	374
375	376	377	378	379	380	381	382	383
384	385	386	387	388	389	390	391	392
393	394	395	396	397	398	399	400	

Print your name and address, detach and mail to
Editor, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

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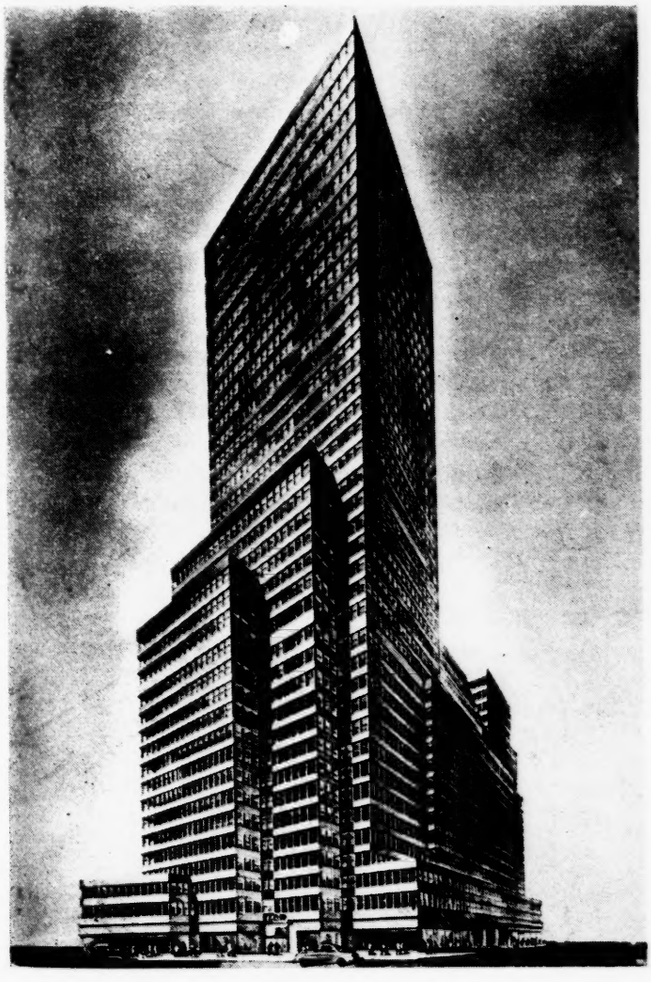
NEWS OF THE MONTH

AIR CONDITIONED SKYSCRAPER

to offer individual office climate to Times Square area.

The 42-story skyscraper now rising at 1407 Broadway, in New York's Times Square district, will be completely air conditioned by the Carrier Conduit Weathermaster System, the largest such installation in the world.

• **ONE OF FOUR.**—Thus four of the great skyscrapers now under construction in a comparatively small area in mid-town Manhattan will use this new system,



1407 Broadway

giving individual occupants complete control over their own indoor weather. Contracts were signed earlier this year for similar installations in the 39-story Secretariat Building of the United Nations, the 36-story office building at 100 Park Avenue and the 25-story Mutual Life Insurance Company building at 55th and Broadway.

• **SPACE SAVER.**—At 1407 Broadway, space savings through the concentration of air handling equipment and through the use of small steel conduits rather than large ductwork for moving conditioned air will amount to some 57,000 square feet of rentable space. Actually, if conventional ductwork had been used, 1407 Broadway would have been a 40-story rather than a 42-story building had the owners decided to hold it to the same height as is now planned, according to Cloud Wampler, president of Carrier Corp.

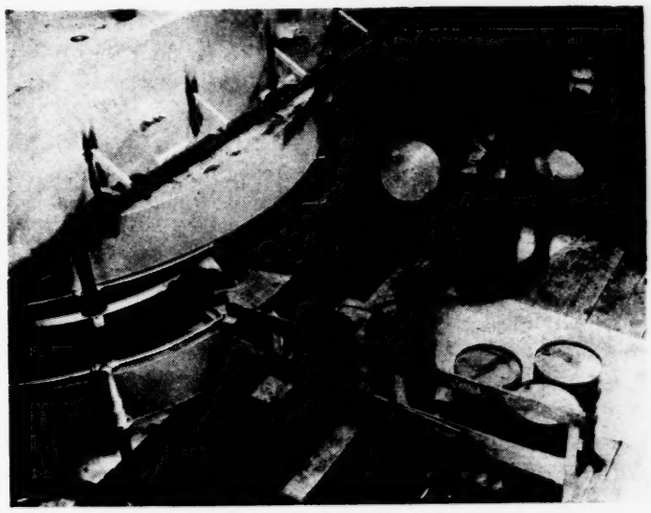
More than six miles of small conduit will be used to carry conditioned air at high velocity to all outside rooms at 1407 Broadway. Also, the installation will be unique in its handling of the interior zones. Conduits will be used to bring air up to the interior zones and ductwork will be used only for the horizontal movement of air in comparatively small areas on the different floors.

• **WEATHER DIAL.**—The conduits will be paralleled by small pipes carrying chilled water in summer and hot water in winter. Both air conduits and water pipes run into individual Weathermaster units in each outside room, permitting occupants to dial their own weather, regardless of the conditions desired by those next door or on the other side of the building.

Refrigeration for summer air conditioning will be furnished by two centrifugal compressors installed below ground. More than 70,000,000 pounds of steam will be used annually for air conditioning, heating and hot water.

S. M. Hirsch is president of the 1407 Broadway Realty Corporation. Architects are Kahn and Jacobs; consulting engineers, Jaros, Baum and Bolles; the general contractor, J. H. Taylor Construction Company; and the mechanical contractor, Raisler Corporation.

OIL-COOLED CYCLOTRON



Special oil developed by Gulf will circulate at 600 gpm to cool the 90-ton magnet of the Carnegie Tech Cyclotron, now under construction.

HOUSE COOLING

to be studied by ceramics group at University of Texas. Seven ceramic houses used as models.

Ceramic experts at the University of Texas have started a long-range study of the hot days in that state, when temperatures sometimes reach the high mark of 114 degrees in arid border sections and then sometimes drop to the low seventies at night.

As part of the university's Bureau of Engineering Research, the ceramic housing research division is right now trying to learn just what type of home will better withstand the Texas sun and will give the best all-year comfort in the Texas climate.

• **CERAMIC HOUSES.**—The work is being conducted under supervision of Dean W. R. Woolrich of the university's College of Engineering on seven new model homes in Austin. All except one are built entirely of ceramic materials, and one partly of ceramics and partly of lumber. They are typical of many new residential units being built throughout the southwest.

• **COOLING SYSTEMS.**—Some of the cooling systems being investigated are: evaporative cooling by water spray; water-flooded roofs; air circulation through the walls; through floor and ceiling space; and by attic fans. No time limit has been placed on the research, but it is expected to continue for at least two years.

The aerodynamics of house structure and aerodynamic house cooling engineering is also being studied closely by aeronautical engineers of the University who have been temporarily assigned to the ceramic housing research program.

CLIMATE CONTROL FORUM

introduces panel of experts who will assemble data for educational campaign by magazine.

Public education regarding the impact of climate, with all its variations, on design and livability of houses, is to be a major editorial objective of *House Beautiful Magazine*, according to an announcement by Miss Elizabeth Gordon, editor of the magazine. Miss Gordon introduced the policy at a meeting of manufacturers, architects, scientists and realtors at the first annual forum of House Beautiful's climate control project. Miss Gordon explained the project as a search for a guide to more comfortable housing, a guide that would tell home owners, architects, and manufacturers what the climate stresses of their own region are. "We wanted a check list of what things a house should do to master its climate and how it should do them."

• **EXPERTS.**—A panel of experts assembled by the magazine includes Dr. Ralph Linton, Dr. Paul Siple, Dr. Helmut Landsberg, Dr. L. P. Herrington and others associated with the problems of climate, comfort, and house design.

Dr. Siple's contribution to the project was to map the climates of America in considerable detail and to prepare regional analyses for the selection of the ideal house for each of the several regions. At the first forum, Dr. Siple presented a discussion of the climate of Columbus, Ohio, and showed graphical analyses of wet and dry bulb temperatures, frequencies of occurrence, solar and wind analyses, and precipitation analyses showing depth and frequencies of rain and snowfall and diurnal variation of humidity for each month of the year. The report includes an interpretation of the data as applied to house design. Dr. Siple's reports covering 16 climatic regions will be treated broadly in *House Beautiful Magazine* and will be published in detail by the American Institute of Architects.

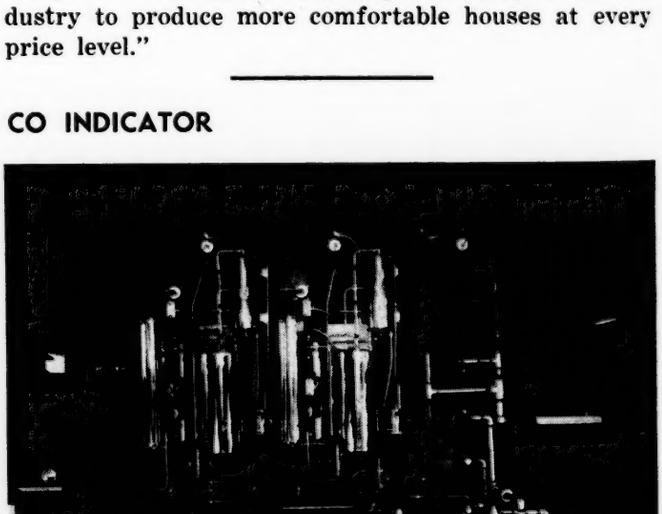
Dr. Landsberg discussed micro-climatology and house building, showing that irregularities of terrain, vegetation, and local exposures can result in appreciable localized differences in temperature, wind velocity and other factors affecting house design.

Dr. Herrington discussed the physiology of comfort and factors of temperature, humidity, and air movement affecting comfort.

• **OBJECTIVE.**—Chief objective of the climate control project, said Miss Gordon, was to educate the public regarding the influences of climate and human physiology upon house design, to tell people what a good house is, and to develop general understanding of the vocabulary involved so that the public will begin to ask for as much technological development in housing as modern scientific and manufacturing techniques have made available.

"There is nothing mysterious or revolutionary about what we have done," Miss Gordon insists. "We have merely collected and organized into readily usable form the data that climatologists have been collecting for years. We think it can help everybody in the industry to produce more comfortable houses at every price level."

CO INDICATOR



Maze of piping and instruments make up carbon monoxide recorder developed by Mine Safety Appliances Co., Pittsburgh, and used to protect motorists driving through West Rock Tunnel on the Wilbur Cross Parkway at New Haven, Conn. This equipment can detect one part of the deadly CO gas in a million parts of air.

STATE REGULATIONS

liberalizing compensation for respiratory diseases and spurring slum clearance construction may affect heating and ventilating industries.

Bills liberalizing workmen's compensation laws have been widely enacted by state legislatures this year in continuation of a trend which has spread rapidly in recent years.

• **COMPENSATION.**—A survey reveals that states enacting bills boosting benefits or otherwise liberalizing such laws include Alabama, Montana, New Jersey, Ohio, Pennsylvania, Rhode Island, South Dakota, Tennessee, Vermont, West Virginia, Wisconsin and Wyoming.

• **ALABAMA.**—Alabama's legislature enacted a measure calling for an increase in workmen's compensation payments to $21 per week and an increase in maximum payments from $6,000 to $8,400. It also raised medical and hospital payments.

• **MONTANA.**—A bill providing for a $2.50 weekly increase in workmen's compensation benefits was enacted in Montana. Under the new law, the maximum will be $20 for a single man and $26 a week for a man with five or more dependents. Another new Montana law increased maximum medical aid and hospital benefits under the workmen's compensation act to $1,000.

• **NEW JERSEY.**—New Jersey's legislature enacted a bill providing "full coverage" for workers under the workmen's compensation law. It extends workmen's compensation, either for injuries or death arising from employment, when such injuries or death arises from "compensable occupational disease." New Jersey law heretofore defined a specific list of occupational diseases which were compensable. That list is abolished by the new law, which defines compensable occupational diseases as follows: "All diseases arising out of and in the course of employment, which are due to causes and conditions which are or were characteristic of or peculiar to a particular trade, occupation, process or employment, of which diseases are due to the exposure of any employe to a cause thereof arising out of and in the course of his employment."

• **OHIO.**—Enacted by the Ohio legislature was a bill boosting workmen's compensation benefits from $25 to $30 weekly and increasing death payments from $7,500 to $8,000.

• **PENNSYLVANIA.** — Maximum weekly workmen's compensation benefits have been raised in Pennsylvania from $20 to $25. The new Pennsylvania legislation also boosted occupational disease benefits 15%, and increased allowances for medical services from 60 to 90 days and from $150 to $225.

A number of bills in Pennsylvania relate to workmen's compensation, including one adding to the list of compensable occupational diseases disability arising from silicosis and asbestosis, or disability arising from any cause concerned with the peculiar characteristics of employment, and repealing that part of the state law which provides specific and lower compensation for silicosis and asbestosis.

• **SOUTH DAKOTA.** — Passed by the South Dakota legislature was a bill raising the workmen's compensation ceiling from $20 to $25 a week, and boosting the minimum from $7.50 to $10.

• **TENNESSEE.**—A new Tennessee law increased workmen's compensation allowances from a lump sum maximum of $6,500 to $7,500 for total disability, and increased maximum weekly benefits from $20 to $25.

• **VERMONT.** — Vermont's legislature increased minimum weekly workmen's compensation benefits from $10 to $12 and the maximum from $20 to $25. It also doubled hospital and medical benefits, raising the ceiling from $375 to $750.

• **WEST VIRGINIA.**—Enacted in West Virginia was a bill increasing weekly workmen's compensation benefits from a maximum of $18 to $25, widows' benefits from $30 to $50, and making occupational diseases other than silicosis compensable.

• **WISCONSIN.**—A bill enacted in Wisconsin increased maximum workmen's compensation weekly benefits from $28 to $33.55. It also increased payments for death or major injury.

• **WYOMING.**—The Wyoming legislature also approved a bill increasing benefits. The new liberalizing law was described by its sponsors as the most important piece of Wyoming legislation affecting workmen since the original enactment of the state workmen's compensation act in 1915.

• **IDAHO.**—An Idaho bill which would have broadened provisions of the state's present silicosis law and added other respiratory diseases as compensable under the state workmen's compensation act was vetoed by Gov. C. A. Robins, who pointed out that other legislation provided for an interim legislative study of Idaho workmen's compensation and occupational disease laws.

Bills to liberalize workmen's compensation in various respects are still pending in several other states.

Proposals to broaden workmen's compensation statutes to include employes of small firms now exempt were introduced in a number of state legislatures, but no new enactments of such bills have been reported thus far this year.

• **HOUSING AIDS.** — A considerable increase in the volume of housing construction, slum clearance and urban redevelopment stimulated by new federal legislation will result from new laws enacted this year in a number of states in extension of a trend which has seen state governments move steadily deeper into these fields in recent years.

Analysis of the new state laws reveals that some embrace new conceptions of potentially far-reaching significance of the role of government in housing. Others follow patterns already established by the states in public housing legislation and in their efforts to stimulate private action in slum clearance and the construction of low-rent housing projects.

Pennsylvania's legislature enacted a series of bills designed to spur at least $50,000,000 in low-rent housing construction in the state during the next two years, with the possibility that, with federal participation, the total may go up to $100,000,000 or $150,000,000.

The new Pennsylvania statutes include a $15,000,000 state appropriation for outright subsidies to private

and public builders and redevelopment authorities. Of the total, $10,500,000 is earmarked for subsidies, up to 35%, to public and private builders willing to build homes with rentals controlled by the state for at least 25 years. The balance is set aside for slum clearance and urban redevelopment.

Veterans and persons displaced by housing projects will be given preference for five years in the rental homes built under the Pennsylvania program. Through the subsidies to successful low bidders among private capital, private builders or public housing authorities, the program aims at providing home units renting from $50 to $65 monthly for persons earning less than $4,500 annually. The legislation prohibits any discrimination on account of race, color or creed.

New Jersey's electorate will vote in November on a $100,000,000 bond issue to backstop state loans to private builders and to local public agencies for construction of low-rent housing and slum clearance. Meanwhile, efforts will be made to get the program under way through revenue-anticipation bonds. It is hoped to provide some 45,000 apartment units renting at $45 to $55 per month, but nothing in the new housing law restricts rentals to those figures.

Under the New Jersey program the state will loan money at low interest rates to private building companies first and then to local housing agencies. The proposed $100,000,000 bond issue would be used only if a market failed to develop for revenue-anticipation bonds. Even if the voters approve the plan, Governor Alfred E. Driscoll explained, the bond issue may never be used and, by the same token, defeat of the bond referendum would not result in death of the entire housing program. Veterans are to receive preference on half of the apartments after those people displaced by slum clearance are relocated.

Wisconsin enacted a bill providing for the expenditure of a $16,000,000 state veterans' housing fund. The new law allots 20% of the state fund, or approximately $3,200,000, for outright grants to local housing authorities, which usually plan low-rent apartment projects. The other 80% will be used for second mortgage loans to veterans or to cooperatives. Eligible houses would cost less than $10,000, but money could be borrowed for improved existing housing. If the loan portion is not all used as rapidly as expected, the amount alloted for housing grants will be raised to 40%.

The new Wisconsin housing legislation became possible after the state's voters in April approved by a narrow margin a state constitutional amendment to permit the state to provide financial aid for veterans' housing.

New York legislature enacted legislation authorizing referenda in November on three housing propositions: To increase the state loan fund for public housing by an additional $300,000,000; to raise the maximum annual limit on new subsidy contracts from $1,500,000 to $2,500,000, and to increase from $13,000,000 to $25,000,000 the annual subsidy for public housing.

Also enacted in New York was a bill creating a 132-member statewide committee to assist in efforts to bring down the costs of housing construction. Members of the committee include representatives of the building trades, contractors, members of the engineering and architectural professions, officials of savings banks and life insurance companies, and representatives of the general public.

Connecticut's former $45,000,000 bond-guaranteed program to finance construction of low-rent housing units will be expanded to $65,000,000 in bonds. The program also was changed so that instead of the state guaranteeing housing bonds issued by local authorities, the state will float a general bond issue and reloan the money directly to the authorities.

The Connecticut program aims at construction of at least 6,500 housing units for rental to war veterans and low-income families for between $38 and $40 a month. An additional $30,000,000 part of the new program authorizes the state to finance construction of 3,000 single-family homes for sale to low income families or veterans. Veterans will not have to pay anything down and non-veterans will make small payments.

California's legislature provided for a referendum next year on a $100,000,000 bond issue for continuation of the state's home and farm purchase program of loans to war veterans. Another new California measure provides for construction loans to war veterans under the low-interest farm and home purchasing plan. California veterans heretofore could get state assistance in buying completed homes only.

Ohio has a new law designed to enable cities to eliminate slum and blighted areas. Besides liberalizing bond issue requirements, it allows cities to purchase or condemn blighted areas and then sell or exchange the land for redevelopment by private enterprise.

Maine's legislature passed an enabling act for low-rental housing projects, with a local option clause. The measure will permit acceptance of federal funds for local housing projects.

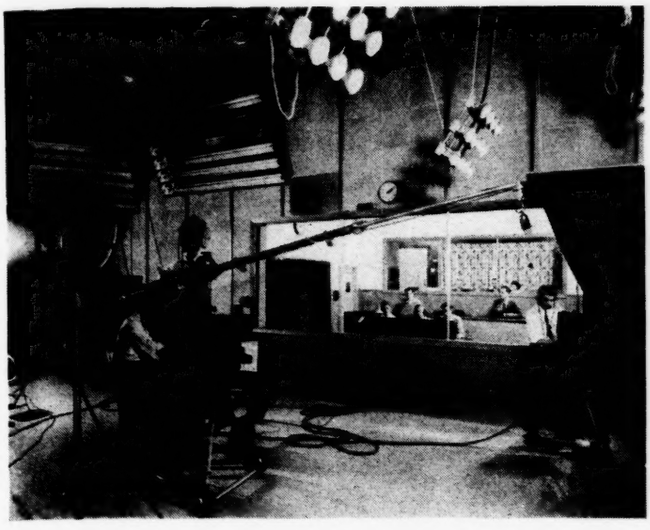
Nebraska cleared the way for insurance companies to enter the rental housing field in that state. Insurance companies with capital and surplus of more than $5,000,000 or any non-stock company with surplus of that amount, may take advantage of the new Nebraska statute. Under the measure, the projects must be comprehensive and low-rent units, and provide living quarters for at least 50 families.

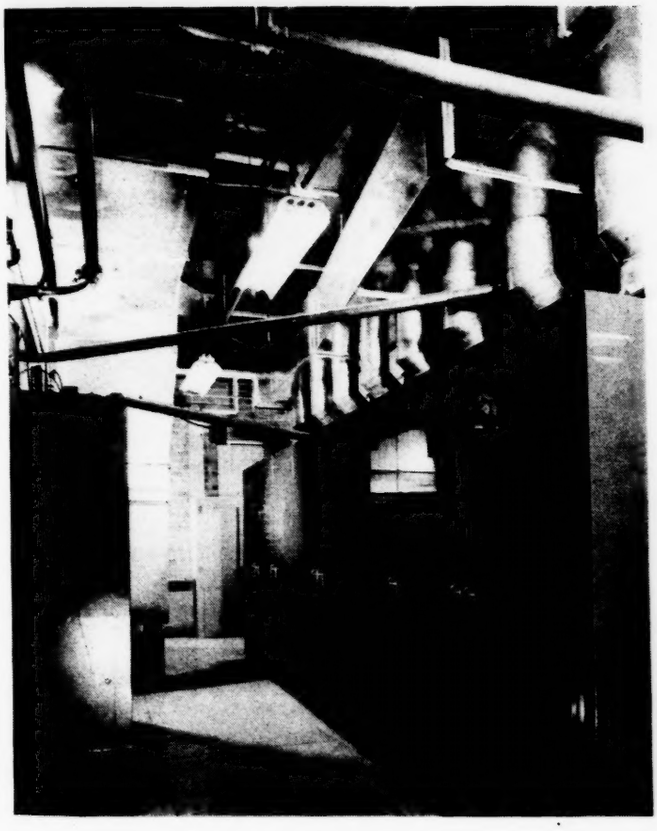
Idaho's legislature enacted a bill providing that life insurance companies may acquire real property as an income investment.

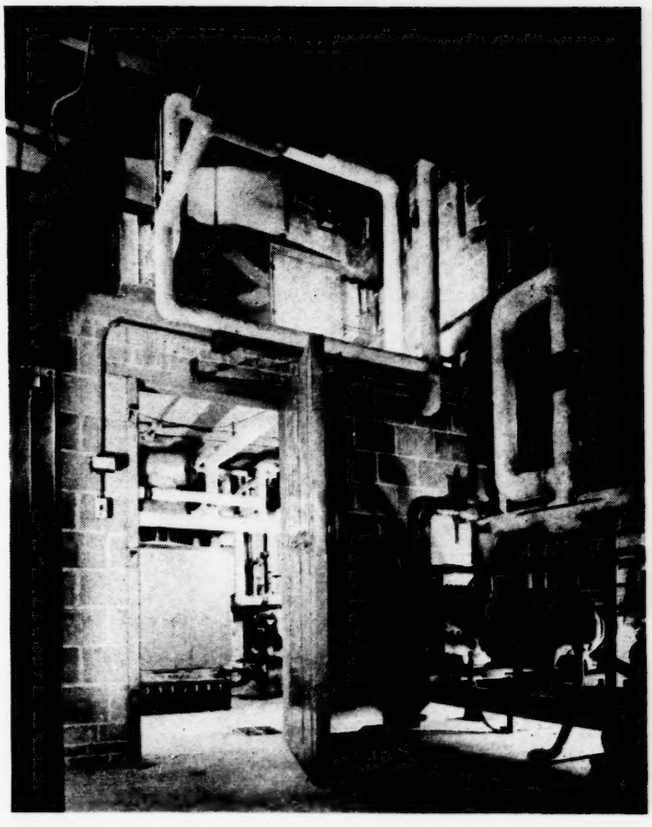
• The world's deepest producing oil well was recently completed by Standard Oil Company of California near Wasco, and is 15,530 feet deep, almost 1,000 feet deeper than any other producing oil well.

• Two new anthracite mining machines—a scraper-shaker loader and a light-weight shearer—designed to increase efficiency in anthracite mines are described in reports released by the Bureau of Mines.

AIR CONDITIONED TELEVISION STUDIO







(Above left) What television performers see as they face the camera in the Miami Valley Broadcasting Corp.'s new WHIO-TV studio at Dayton. Engineers of The Austin Company, which designed and erected the station, have provided a tiered arrangement of the studio, control room, clients' audition room, and reception lobby, which is concealed behind the figured drape in the extreme background.

(Left) Heat produced by FM-equipment behind the scenes in the transmitter room at WHIO is vented direct to the outside during warm weather and is returned for use in heating the studios during cold weather. The side band filter can be seen on the extreme left, while the FM-transmission line is enclosed in the conduit in the foreground. A special 7,850 cfm ventilating unit in the left background presently serves the studio and other areas which have been designed for future air conditioning.

(Above) Principal heating and air conditioning units are compactly housed. Heating is provided by a Bryant gas-fired boiler, which can be seen through the doorway. A pair of small Frigidaire compressors operating in tandem provide 25 tons of refrigeration for the McQuay air conditioning unit, which has been mounted on a concrete floor slab directly above the boiler room.

AIR CONDITIONED BUS

features high pressure cooling system, double walls, heat filtering glass.

An air conditioning system with a cooling capacity equal to the melting of 12,000 pounds of ice each 24 hours has been installed in the Greyhound Lines' new luxury bus. The ultra-modern bus, known as the Scenicruiser, is now being demonstrated and tested in many cities across the country.

• **HIGH VELOCITY AIR.**—By means of a system designed for bus application employing principles of the high pressure Carrier Conduit system, air is distributed at high velocity through ducts along the floors and through the walls in such a way that they are cooled in summer and warmed in winter. Conditioned air is released into the passenger compartments through high velocity outlets along the top of the side walls. It is possible to change the air in the huge bus completely every 40 seconds.

• **REFRIGERATION.**—A compact refrigeration system is installed in one of the baggage compartments of the bus, consisting of a high-speed compressor with automatic self-contained capacity controls, condens-

ing and cooling coils manufactured especially for this installation. Design of air conditioning system was a collaboration between Tropic-Aire and Greyhound engineers.

Circulation of chilled air in summer and warm air in winter is controlled by three fans—one for the forward compartment which seats 10 persons and two for the raised "stratodome" compartment which seats 33. At the extreme rear, an eight-seat semicircular lounge section faces observation windows that curve clear across the bus.

Circulation channels for conditioned air run along the floors, under the passenger seats. Air is taken to the side walls through the support struts of each seat. The double walls provide a space for air circulation, with outlets at the top of this space.

Glass along the top and sides of the bus is in double thickness and is treated to filter out a great deal of the heat normally caused by the sun's rays as well as to protect the eyes of the passengers while still allowing them a clear view.

SNOW MELTING SYSTEM

installed for Boston insurance company will be largest sidewalk system in New England.

Heat supplied to about 720 ft of pavement by means of hot water circulating through a system of embedded pipe coils will keep the sidewalks of the new 26-story John Hancock Mutual Life Insurance Company's building in Boston free of snow during the coming winter. The hot water will be drawn from the company's heating plant by an electric pumping system, which will be switched on only when snow begins to fall. The system can handle about one inch of snow an hour, about the fastest pace of snowfall. In addition to the sidewalks, snow melting equipment is being built into the building's 50 x 150-ft truck loading area. This will not only keep that area free of snow, but will help to evaporate the water and ice that constantly drip from the undersides of vehicles using the driveway. Snow melting coils are also installed in the attractive facade of the building to keep it free from ice accumulation. Radiant heating is also being installed in the main lobby and in the foyer of the big auditorium.

It is hoped the project will be self-liquidating over a period of years. Last year the company spent only $700 for snow clearance. But in the previous winter the cost was $3,000 to clear snow from the sidewalks of the older building, which the new structure adjoins. This is the largest sidewalk snow melting system in New England. The three main advantages are described by company officials as: Good will of the public using the sidewalks around the combined buildings; time and cost-saving for maintenance men who are generally called off other duties to shovel snow; and prevention of damage to sidewalks from the use of chemicals in dissolving the snow.

NEWS BRIEFS

• An air pollution symposium will be featured at the St. Louis meeting, January 3 to 6, 1950, of the American Meteorological Society. The symposium will include a panel discussion and a series of technical papers emphasizing the meteorological and climatological phases of air pollution.

• A project for the compilation of tables of thermal data on wind tunnel and jet engine gases has been established at the National Bureau of Standards. The evaluation of 13 properties for each of 13 gases is contemplated.

• A need for mechanical cleaning of coal is being spurred by rapid depletion of the purer, thicker coal beds of the east, according to Thomas F. Downing, Jr., of the Philadelphia Electric Company, speaking to the American Society of Mechanical Engineers.

• At the United Nations Scientific Conference on the conservation and utilization of resources at Lake Success, New York, August 31, talks covered utilization and conservation of fuel resources pointing out that fluid fuels are diminishing in supply. Alternate sources of power were discussed, one of which was a giant windmill described by a member of the Federal Power Commission.

• A new industrial mineral with a wide range of possibilities for commercial and industrial use is under study at the New York State College of Ceramics. Wollastonite has already been found useful as a component for thermal insulation, mineral wool, and other materials. Research project is on the pilot-plant scale under the Office of Technical Services, U. S. Department of Commerce.

• The Sectional Committee on the Code for Pressure Piping, ASA-B31, has been reorganized under the chairmanship of F. S. G. Williams of the Taylor Forge & Pipe Works, 50 Church St., New York, N. Y., with Sabin Crocker, Ebasco Services, Inc., 2 Rector Street, New York, N. Y., as vice chairman, and Lester W. Benoit, Manufacturers Standardization Society of the Valve and Fittings Industry, 420 Lexington Ave., New York, N. Y., as secretary. The present Code for Pressure Piping, with Supplement No. 2, as approved by the American Standards Association on April 7, 1947, is up for consideration and for revision. Section 5, covering refrigeration piping systems, is up for revision under the chairmanship of A. C. Buensod, 60 East 42nd St., New York, N. Y.

• Constant temperatures through all seasons of the year with varying ranges of relative humidity best suited to the demands of rayon processing are provided in the air conditioning system installed by Carrier Corporation in the new plant of Robbins Cloth Mills Inc., at Aberdeen, N. C. The installation for the mill area comprises nine separate systems with a total distribution capacity of 637,600 cfm.

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

HEAT TRANSFER

The first of two volumes devoted to the fundamentals of heat transfer has been published as a treatise for research workers and as a textbook for graduate and intermediate teaching. The author is Dr. Max Jakob, research professor of mechanical engineering, Illinois Institute of Technology; consultant in heat research, Armour Research Foundation; and non-resident research professor of heat transfer, Purdue University.

Besides containing two chapters on radiation, the book covers conduction and convection from physical theory, mathematical approach and experimental data. While space is devoted to experimental methods and techniques, attention is also directed to the influences of chemical composition, state of phase, physical structure, quality of surface, temperature, etc. Considerable space has been devoted to experimental methods and techniques in order to give at least some idea of the various procedures of determining thermal conductivities, characteristics of convection, temperature distributions, and paths of heat flow.

The 30 chapters and appendices of the book are in turn divided into five main divisions or sections as follows: Basic equations of heat transfer; properties of matter significant for heat transfer; heat conduction in simple bodies; heat convection without change of phase or constitution; heat convection, including changes of phase.

Dr. Jakob so planned his work that the first part of the book contains the basic equations of heat transfer through conduction, convection and radiation; part two deals with the most characteristic properties occurring in each of these heat branches; next are presented problems dealing with the three kinds of heat flow.

Heat Transfer, by Max Jakob. Cloth bound, 6 x 9 inches, 758 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $12.

INDUSTRIAL HYGIENE AND TOXICOLOGY

Volume II of the two-volume set on Industrial Hygiene and Toxicology, prepared under the editorship of Frank A. Patty, director, Industrial Hygiene Service, General Motors Corp., has just been issued. Volume I, which covered the engineering side of the subject, including ventilation, fire and explosion hazards, sampling, and dust, was published in 1948.

Volume II stresses the properties and physiological action of atmospheric contamination, describes industrial exposures, touches upon specific analytical methods, and discusses permissible concentrations, flammability, odors and warning properties.

Authors of the various chapters in this volume include Dr. W. B. Deichmann, head, division of pharmacology, Union University, Albany, N. Y.; Dr. D. O. Hamblin, medical director, American Cyanamid Co., New York; Dr. Francis F. Heyroth, associate professor of industrial toxicology, Kettering Laboratory of Applied Physiology, College of Medicine, University of Cincinnati, Cincinnati, Ohio; Dr. F. R. Holden, Naval Radiological Defense Laboratory, San Francisco, Calif.; Dr. R. A. Kehoe, director, Kettering Laboratory of Applied Physiology, University of Cincinnati; F. A. Patty, director, Industrial Hygiene Service, General Motors Corp., Detroit, Mich; Dr. J. H. Sterner, director, Laboratory of Industrial Medicine, Eastman Kodak Co., Rochester, N. Y.; and Dr. J. F. Treon, Jr., Kettering Laboratory of Applied Physiology, University of Cincinnati.

Subject matter is divided into twenty lengthy chapters and is subdivided for ready reference.

Industrial Hygiene and Toxicology, Vol. II, edited by Frank A. Patty. Cloth bound, 6½ x 10 inches, 630 pages. Published by Interscience Publishers, Inc., 215 4th Ave., New York, N. Y. Price, $15.

REFRIGERATING PRINCIPLES AND PRACTICES

Although, as pointed out by the author, there has been little development in the theory of refrigeration since 1900, there have been various approaches in presenting the principles of refrigeration in books written to aid the student in obtaining a better concept of both refrigeration theory and practice.

In the textbook by Norman Sharpe, chairman of the refrigerating and air conditioning department, California State Polytechnic College, San Luis Obispo, Calif., material is presented in the order in which it is believed the engineer would make calculations for a typical installation. Following a chapter covering the refrigerating load, 132 pages are devoted to the thermodynamic and chemical properties of refrigerants commonly used. Descriptive material is accompanied by engineering methods and data.

Material is divided into ten chapters, plus a 14-page appendix. Besides the topics mentioned, the book chapters include refrigeration cycles; compressors and their lubrication; heat transfer equipment; the expansion valve and the accumulator; accessories; piping for refrigerating systems; motors and their controls; and refrigeration applications.

This text contains explanations and data relating to refrigeration that should be of value to those wishing to obtain a better technical groundwork.

Refrigeration Principles and Practices, by Norman Sharpe. Cloth bound, 6 x 9 inches, 398 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $4.

POLLEN SLIDE STUDIES

For those who are able to use a microscope this book contains information to help in veryfying the identity and purity of dry pollens to be used for

diagnostic and treatment extracts. The author is Dr. Grafton Tyler Brown, instructor in clinical medicine at the Georgetown University School of Medicine, and consultant on allergy of the U. S. Public Health Service. Included in the book are 182 drawings of pollen grains and fungus spores in addition to 34 photomicrographs. The text was developed to provide the know-how of pollen counting and to bring to the attention of the reader the various genera of pollen grains.

Pollen Slide Studies, by G. T. Brown. Cloth bound, 6 x 9 inches, 122 pages. Published by Charles C. Thomas, Springfield, Illinois. Price, $6.00.

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MINERAL WOOL INSULATION—CS-1117-49 has been released by the Commodity Standards Division of the National Bureau of Standards to cover mineral wool insulation for heated industrial equipment. These standards establish minimum specifications for insulating heated surfaces with mineral wool. It includes thicknesses of insulation required for various operating temperatures, recommended methods of installation and method of guaranteeing compliance with the standard. It is intended as a guide to engineers, contractors, installers and manufacturers. Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 15 cents.

PERFORMANCE OF A ONE-PIPE STEAM SYSTEM.—Results of tests made on a one-pipe steam system in the I-B-R Research Home during the winter of 1945-46 at the University of Illinois are given in Engineering Experiment Station Bulletin Series No. 383, "Progress Report on Performance of a One-Pipe Steam System in the I-B-R Research Home." The tests were undertaken to determine the operating characteristics of a gas-fired one-pipe steam system using small tube radiators equipped with non-vacuum venting valves when operating under actual conditions. The over-all operating efficiency for the steam system in this home was about 68.5% at an indoor-outdoor temperature difference of 34F. Price, 25 cents. Engineering Experiment Station, University of Illinois, Urbana, Ill.

STUDY OF A BASEBOARD CONVECTOR SYSTEM IN A TEST BUNGALOW—A 20-page pamphlet has been issued presenting data obtained in a study of a baseboard convector heating system in a test bungalow. The tests described were made to determine temperatures produced at various levels upon the floor with a type of baseboard heating system using finned piping adjacent to all the exterior walls of the house at the baseboard level. Vertical temperature differences, room to room temperature differences, heat loss of the house and heat emission per unit length of finned pipe were observed for a range of outside air temperatures. Two types of room temperature controls were studied with this heating system. For a copy of Building Material and Structures Report BMS 115, A Study of a Baseboard Convector Heating System in a Test Bungalow, write to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 15 cents.

ACRMA EQUIPMENT STANDARDS—The 1949 supplement to the Air Conditioning and Refrigerating Machinery Association Equipment Standards has just been issued. This supplement includes the following seven new or revised equipment standards: Room air conditioners; self-contained air conditioners; open-type refrigeration condensing units for commercial applications of 20 horsepower and smaller; high-speed ammonia compressors; application of refrigerant heat transfer equipment; water cooling towers for use with refrigerating equipment; and application and installation of compression refrigeration systems. This 32-page booklet can be obtained by writing to the Air Conditioning and Refrigerating Machinery Association, Inc., Southern Building, Washington 5, D. C. Price, $1.00.

BEST COALS FOR SMALL STOKERS—Bulletin 475 on Burning Washington Coals on Different Types of Domestic Stokers in the Same Hot Water Boiler is intended to help householders and the coal industry select automatic coal-burning equipment suited to the different coals available in the commercial market. In all, 166 burning trials were made in three domestic stokers on 19 different coals ranging from lignite to semi-anthracite. All the coals tested were mined in Washington and Oregon, but the results of the tests are applicable to similar coals throughout the country. A domestic overfeed-type stoker, a clinker-type underfeed stoker and an anthracite ash-removal type underfeed stoker, installed successively in the same hot water boiler, were used in the tests. For a copy of the 96-page bulletin write to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 30 cents.

STEEL COLUMNS—A review of the literature that dates back to 1921 and an appraisal of data pertaining to column tests and studies are presented in Bulletin 91 on Steel Columns, a Survey and Appraisal of Past Works. This bulletin was prepared by A. A. Jakkula, formerly professor of structural engineering, and Henson K. Stephenson, acting professor of structural engineering, Texas A & M College, as a cooperative investigation of the college and the Public Roads Administration, Washington, D. C. Divided into six major divisions, the bulletin covers steel column tests and studies, collection of metal on steel column tests, review of literature and current opinion, and correlation of steel column test data with the secant formula. Texas Engineering Experiment Station, College Station, Texas.

HAND-FIRED SMOKELESS COAL HEATERS.—A paper presented by Julian R. Fellows, professor of mechanical engineering, University of Illinois, before the Eighth Conference on Coal Utilization is reprinted as Engineering Experiment Station Reprint Series No. 44. The paper, Present Status of the Development of Hand-fired Smokeless Coal Heaters, covers the two designs of the Illinois smokeless furnace. Methods of tests and the results obtained are described. Price, 15 cents. Engineering Experiment Station, University of Illinois, Urbana, Ill.

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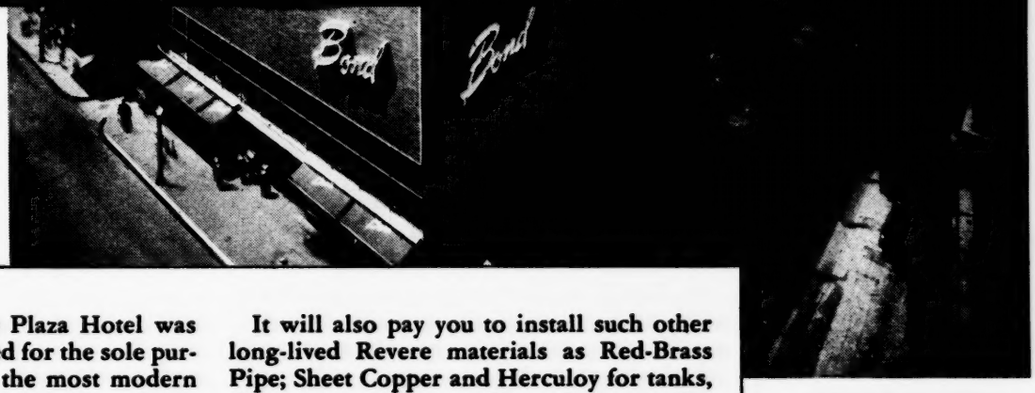
135,000 pounds of Revere Copper Water Tube insure efficient service from the Terrace Plaza's hot and cold water lines and air conditioning system.



Cincinnati's new Terrace Plaza Hotel was "conceived and constructed for the sole purpose of rendering guests the most modern conveniences known to science and the ingenuity of man." Every detail of construction was selected for its ability to provide the finest service.

Consequently, Revere is particularly proud that 135,000 pounds of Revere Copper Water Tube were used in the hot and cold water lines and air conditioning system of this carefully-planned hotel.

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Cincinnati, Ohio

Skidmore, Owings & Merrill—Architects; Jaros, Baum & Bolles—Engineers; Frank Messer & Sons, Inc.—General Contractor; E. J. Nolan Corp.—Plumbing and Heating Contractors; Carrier Corporation—Air Conditioning and Refrigeration; Mutual Manufacturing & Supply Co.—Revere Distributor.

NEW CATALOGS

Unit Air Conditioners

Packaged air conditioners for a wide variety of applications are described in a series of bulletins. Each of the bulletins describes, pictures, and gives specifications, ratings and dimensions of a unit type. Units range from 2 to 10 hp. — *Air Conditioning Department, General Electric Co., Bloomfield, N. J.*

Item 205

Fractional Horsepower Motors

A new line of fractional horsepower motors designed for oil burner, blower, circulator, pump, jet, turbine, pump jack and other applications is illustrated in a new catalog, No. 102, printed for the plumbing and heating industries.—*Franklin Electric Co., Inc., Bluffton, Ind.*

Item 206

Convectors

Construction, installation, and operation of National Art convectors in homes, stores, schools, offices and institutions, are described in a 16-page catalog, No. 555, including dimensional data, roughing-in charts, steam and hot water ratings, ordering instructions, sizing methods, and piping drawings.—*The National Radiator Co., Johnstown, Pa.*

Item 207

Convector-Radiators

Catalog No. 4049, 20 pages, covers the new Young line of convector-radiators. Data includes construction details, roughing-in dimensions, ratings, suggested piping diagrams, etc. — *Young Radiator Co., Racine, Wis.*

Item 208

Mercury Switches

Catalog No. 1343, 16 pages, 2 colors, describes a number of types of Honeywell mercury switches. Two basic types are: mercury-to-electrode and mercury-to-mercury. Engineering data and selection tables are presented, as well as complete switch specification charts.—*Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Wayne and Roberts Aves., Philadelphia 44, Pa.*

Item 209

Pipe and Fittings Manual

Catalog Section M-8801, an installation manual for use in connection with the present "Karbate" brand pipe and fittings booklet, Catalog Section M-8800B, gives detailed information on the installation of "Karbate" pipe, fittings and connections, and also on the cements that are used to bond these products.—*National Carbon Co., Inc., 30 E. 42nd St., New York 17, N. Y.*

Item 210

Aluminum Shade Screening

Technical data on sun heat loads and typical calculations of midsummer cooling load reduction with Kaiser aluminum shade screening are contained in a 16-page, 2-color brochure.—*Permanente Products Co., Aluminum Division, 1924 Broadway, Oakland, Calif.*

Item 211

Industrial Heating Service

Therm-a-neering, a heat and control engineering service provided by the Westinghouse Industrial Heating Section at Meadville, Penna., is described in a new 16-page booklet, B-4031. Setting forth some of the problems confronting the designers and manufacturers of heat-using devices, the booklet outlines the facilities available to the industry as an aid in applying controlled heat. Examples show where Therm-a-neering has resulted in the application of the proper heat source and the correct heat control in the design of a variety of commercial products, especially home appliances.—*Westinghouse Electric Corp., Meadville, Pa.*

Item 212

Protective Coatings

Latest 4-page bulletin on Ucilon protective coatings gives information on four groups of coatings expressly developed for corrosion control, chemical resistance and "heavy duty" industrial painting. Coatings are applicable both to structural surfaces and to equipment in interior or exterior locations.—*United Chromium, Inc., 51 East 42nd St., New York 17, N. Y.*

Item 213

CO_2 Analyzer

A 4-page illustrated bulletin describes how the Englehard CO_2 Analyzer measures CO_2 content of flue gases.—*Charles Englehard Inc., 850 Passaic Ave., East Newark, N. J.*

Item 214

Vibration Isolators

A 24-page catalog features information on the Finnflex line of vibration isolators and contains specification charts for selection of the right isolators for various types of machinery. Also included is a discussion of the theory of vibration isolation and shock.—*Finn & Co., 2850 Eighth Ave., New York 30, N. Y.*

Item 215

Tube Expanders

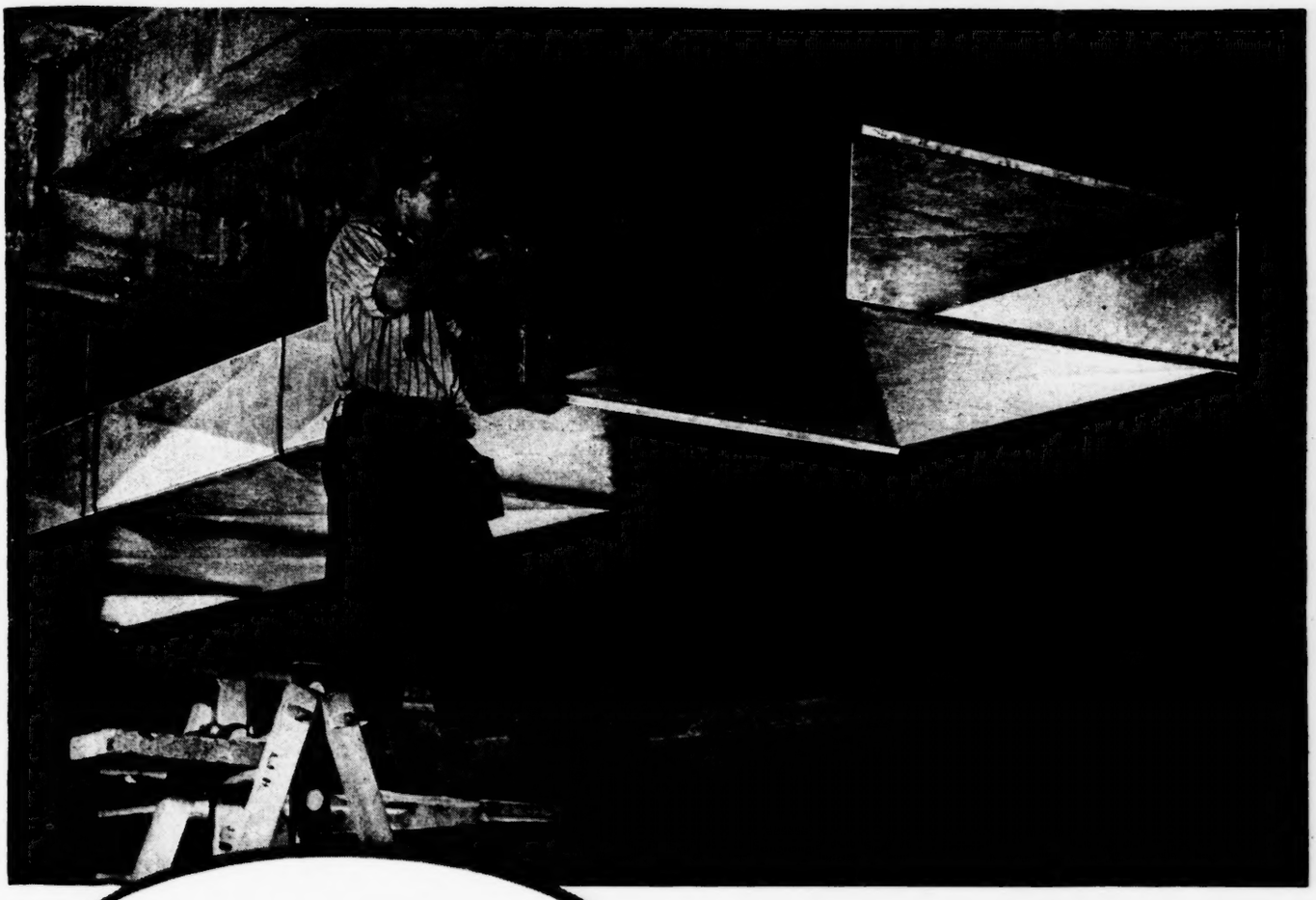
An eight-page bulletin describes the complete Wilson-Dudgeon line of tube expanders for high pressure boiler tubes, super-heaters, economizers, water walls, circulating tubes, downcomers and risers in stationary and marine steam generators. — *Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N. Y.*

Item 216

Air Diffusers

A 4-page folder (Bulletin 28) explains the operation and application of Type HU air diffusers for projection unit heaters.—*Anemostat Corp. of America, 10 E. 39th St., New York, N. Y.*

Item 217



FOR DUCTWORK NOTHING BEATS BETH-CU-LOY

Let's be realistic about sheets. Does your average customer ever express a preference for a particular type, grade, gage or brand of sheets when he signs a contract with you for a duct job? Isn't it true that he is more often interested in how much the finished job will cost, how it will operate, how long it will last, and how it will look?

This means that you, the sheet-metal contractor, are the one who must select materials that can meet these requirements at a low initial cost.

Beth-Cu-Loy galvanized sheets will help you do this. They are made from copper-bearing steel that has more than double the resistance to atmospheric corrosion found in plain open-hearth steel. On top of this they have a heavy, tight coating of zinc for additional protection against rust.

As far as price is concerned, Beth-Cu-Loy galvanized sheets sell for only a few cents more than ordinary galvanized sheets. This small difference buys many times the amount of service and customer satisfaction.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Beth-Cu-Loy GALVANIZED Steel Sheets

Die-Less Duplicating

A new edition of the 40-page Di-Acro catalog covers a system of die-less duplicating benders, shears, forming machines, brakes, etc.—*O'Neil-Irwin Manufacturing Co., Lake City, Minn.*

Item 218

Heat Filtering Glass

How glass may filter daylight to bar rays that tire eyes and carry heat is described and illustrated in an 8-page folder on Blue Ridge Aklo glass. Aklo is said to exclude up to 44.5% of sun heat.—*Libbey-Owens-Ford Glass Company, Nicholas Bldg., Toledo 3, Ohio.*

Item 219

Blowers

Roots-Connersville type AF rotary positive blowers for pressure or suction services are covered in Bulletin 21-B-37. Blowers are built in 18 sizes with capacities ranging from 5 to 700 cfm and pressures from 3 to 7 lbs per sq in.—*Roots-Connersville Blower Corp., 900 West Mount St., Connersville, Ind.*

Item 220

Heating Specialties

A 12-page, 2-color catalog includes for the first time under one cover, the complete line of Dole plumbing, warm air, steam and hot water heating specialties. Described and illustrated are radiator vent valves, gages, air valves, water mixers and flow control valves. —*The Dole Valve Co., 1933 W. Carroll Ave., Chicago 12, Ill.*

Item 221

Fans, Blowers, Collectors

The American Blower line of axial and centrifugal fans, blowers, and exhausters, air conditioning equipment, cooling coils, steam coils, unit heaters, fluid drives, dust collectors, and fly ash precipitators is described in a 48-page catalog, Bulletin No. B-4729. —*American Blower Corp., Detroit 32, Mich.*

Item 222

Residential Boilers

Two new product catalogs describe the Fitzgibbons "80" series and R-Z-U Jr. steel boilers, respectively. The "80" series steel boiler, oil or gas fired for larger residences or small apartments in sizes from 1100 to 3000 sq ft of steam radiation, is described in a 4-page folder. The R-Z-U Jr. steel boiler, 1100 to 3000 sq ft of steam, suited for bituminous coal and stoker firing, is described in the other folder.—*Fitzgibbons Boiler Co., Inc., 101 Park Ave., New York 17, N. Y.*

Item 223

Pipe Engineering

A new section of the Tube Turns series on piping engineering covers welding rings for welded pipe joints, with illustrated information on materials, ring types, codes, fitting, and ring design. Welding rings are for butt-welded pipe joints.—*Tube Turns, Inc., Louisville 1, Ky.*

Item 224

Regulating Valves

Bulletin No. 47-1 describes type FB pilot single seat fully balanced regulating valves for gases and liquids for processing industries. Drawings and photographs supplement dimension tables, application data, and price lists. — *Minneapolis-Honeywell Regulator Co., Belfield Valve Division, Philadelphia 44, Pa.*

Item 225

Dehumidification

Second in a series of illustrated bulletins on the physics of water vapor as related to solid adsorption dehumidification is a new bulletin written by Elmer R. Queer, and E. R. McLaughlin of Pennsylvania State College. — *Department E.G., Pittsburgh Lectrodryer Corp., P. O. Box 1766, Pittsburgh 30, Pa.*

Item 226

Air Conditioning Coil Selection

Air conditioning coil engineering data, including application data for heating and cooling with water, and graphs of friction, air velocities and direct expansion coil selection data are included in an 8-page bulletin. Charts for selection of blast steam heating coils are included. — *Refrigeration Economics Co., Inc., 1231 Tuscarawas St. E., Canton 2, Ohio.*

Item 227

Valve Accessories

Bulletin No. 100-1 covers the Belfield line of brass and iron cocks, check valves, swing joints, transfer valves, etc. Photographs and sectional drawings are included.—*Minneapolis-Honeywell Regulator Co., Belfield Valve Division, Philadelphia 44, Pa.*

Item 228

Compressors and Condensing Units

A 60-page catalog, No. 204-1, illustrates the Mills line of compressors and condensing units. Models include air-cooled ¼- to 3-hp, water-cooled 1/3- to 10-hp, combination air and water cooled ½- to 3-hp units. Specifications, dimensions and selection data are included.—*Mills Industries, Inc., 4100 Fullerton Avenue, Chicago 39, Ill.*

Item 229

Pipe Fittings

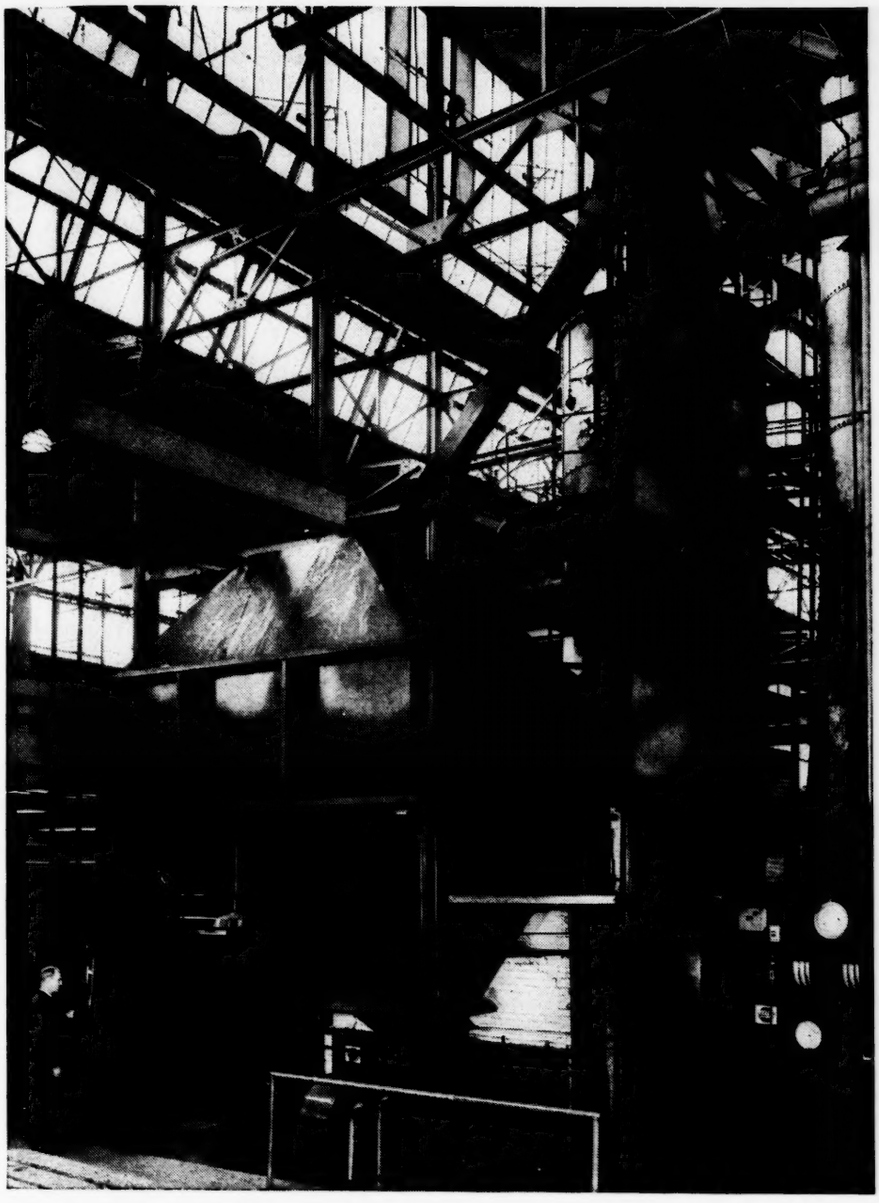
Catalog No. 50 describes and illustrates malleable iron pipe fittings, cast solder joint fittings, and steel nipples. Weights and list prices of products are included. Photographs illustrate manufacturing and testing techniques.—*The Union Malleable Manufacturing Co., Ashland, Ohio.*

Item 230

Replacement Copper Coils

Replacement copper coils for most makes of water heaters, single, double, triple, and instantaneous are shown with list prices in Catalog No. 49-02.—*Dormont Mfg. Co., 1314 High St., Pittsburgh 12, Pa.*

Item 231



A single large Vulcan Ramfeed Stoker fires this 450 H. P. Wickes Vertical Waste Heat Type Boiler — automatically maintaining heat over week-end shutdowns with no attention.

"We switched from oil and gas to Canton Stoker fired coal and saved 2/3 of our former fuel cost"

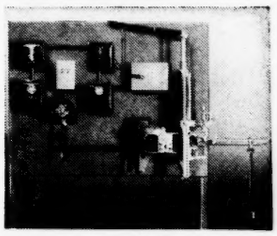
... says the well satisfied plant manager of Babcock Printing Press Corporation, Canton, Ohio

Building the gigantic, modern Babcock Rotary Printing Presses that print a whole magazine in four colors requires a huge high ceilinged plant, plus uniform temperatures for proper fitting of precision parts.

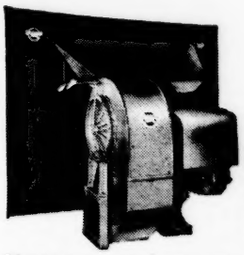
Both oil and gas were tried, but the cost proved excessive ... temperatures varied too much for precision work. CANTON'S Engineers were then called in on the problem, and a complete stoker and coal handling system were installed on their recommendations. In the *first* heating season, the installation saved considerably more than its cost, *returning a substantial profit on the investment* and paying added dividends in improved working conditions.

Consult a Canton Field Sales Engineer (in principal cities) and find out how CANTON STOKERS can help you with your heating or power problem. No cost or obligation is involved. Or write or wire direct to CANTON STOKER CORP., **407** Andrew Place S. W., Canton, Ohio.

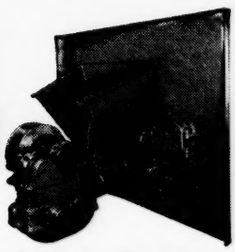
"Turbo-Aire" Jets—for smoke abatement, firing efficiency.



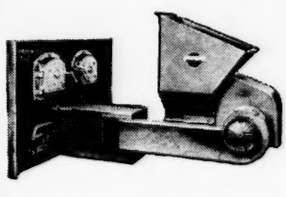
Synchronized Combustion Control Systems — for all boilers.



Vulcan Ramfeed Stokers — for loads up to 800 H.P.



LoSet Ramfeed Stokers—for loads up to 350 H.P.



Duraflex Wormfeed Stokers — for loads up to 175 H.P.

CANTON STOKERS

CANTON STOKER CORPORATION

407 ANDREW PLACE S. W., CANTON, OHIO

Gentlemen:

---Please send all descriptive literature at once

---Have a CANTON Engineer interview us immediately

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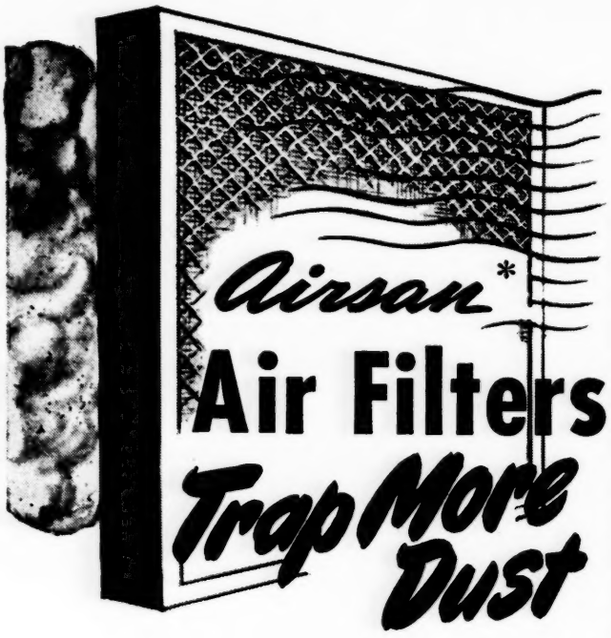
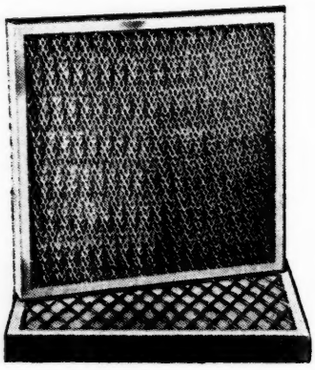
Company ----------

Address ----------

City---------- State----------



For Air Conditioning, Heating and Ventilating



Greater efficiency — lower resistance is yours with an AIRSAN Air Filter.

A permanent, cleanable viscous type filter of all galvanized construction, having full bronze welded corners. Expanded metal face plate acts as lint arrestor to provide easier cleaning and servicing. Rated filtering efficiency 98.5%. In standard 1" and 2" thickness.

Also available for heavy duty service on industrial and special applications — in 2" to 4" thickness. Holding frames (for V-type or straight banks) are made for all type filters.

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Air Filter Corporation

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Airsan

Radiation Pyrometer

Bulletin P1242 on the new Bristol Pyrovisor radiation pyrometer explains the theory of radiation pyrometry and the features of the Pyrovisor Unit. Included are photographs and diagrams illustrating accessories offered to adapt the unit for use with furnaces and kilns for indicating, recording, and controlling temperatures up to 4000F.—*The Bristol Co., Waterbury 20, Conn.*

Item 232

Pre-Cast Chimney

The Van-Packer pre-cast, sectional chimney for one- and two-story houses is described and illustrated in a four-page folder with three inserted sectional drawings. Specifications, installation drawings, and prices are included.—*The Van-Packer Corp., 135 S. La Salle St., Chicago 3, Ill.*

Item 233

Arc-Welding Accessories

A new 20-page catalog containing descriptions, specifications, and prices of more than 150 arc-welding accessories, publication GEC-253A, includes information on electrode holders, helmets and goggles, tungsten electrodes, all types of protective aids and clothing, electrode carriers, cable connectors, ground clamps, brushes, cleaning tools, fillet weld gage, and many other accessories for the arc-welding operator. —*General Electric Co., Schenectady 5, N. Y.*

Item 234

Air-Operated Controllers

A 32-page bulletin, No. A120, describing the company's new line of Series 500 air-operated controllers gives information about the instruments for automatically controlling temperature, pressure, flow, liquid level, humidity, and pH value. Complete data with pictures is given for on-off, proportional, reset, derivative, and reset plus derivative models.—*The Bristol Co., Waterbury, Conn.*

Item 235

Glass Blocks

General and technical data on PC glass blocks, with construction details and specifications are included in a 40-page booklet. Shapes, sizes and accessories available are illustrated. Estimating data is presented.—*Pittsburgh Corning Corp., 307 Fourth Ave., Pittsburgh, Pa.*

Item 236

Names of Valve Parts

The names of valve parts in common use in the trade are set forth in a 4-page bulletin with indexed cross-sectional drawings of various types of valves. Materials ordinarily used in fabrication of parts are also indicated.—*Certified Alloy Valve Division, The Cooper Alloy Foundry Co., Hillside 5, N. J.*

Item 237

Bearing Data

A new 112-page catalog and engineering databook covers the Link-Belt line of ball and roller bearings. Book No. 2550 gives list prices, weights, load ratings, and dimensions for various standard models. Selection, engineering, and installation data are included.—*Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.*

Item 238

Shaded Pole Motors

Two bulletins describe Raytheon shaded pole motors. Bulletin 2000 gives dimensions, ratings, and pictures of two-pole, skeleton frame shaded pole induction motors, 3000 rpm, 1/10 and 1/15 hp. Bulletin 1000 covers similar but smaller motors in ratings from 1/50 to 1/200 hp at 3000 rpm.—*Russell Electric Co., 4501 South Western Blvd., Chicago 9, Ill.*

Item 239

Spiral-Weld Pipe

Bulletin 493 announces that Taylor spiral-weld pipe is available and shows sizes, wall thicknesses, fittings, and flanges and lists typical applications. — *Taylor Forge and Pipe Work, Inc., P. O. Box 485, Chicago 90, Ill.*

Item 240

Silica Gel Air Dryers

A data folder, SGD No. 5, covers Bryant silica gel air dryers for product drying. The 4-page folder shows how to solve an actual problem to arrive at proper selection of equipment.—*Bryant Industrial Division, Affiliated Gas Equipment, Inc., 1020 London Rd., Cleveland 10, Ohio.*

Item 241

Expansion Joints

A new 20-page manual and catalog, No. 50, describes the application of packless, bellows-type, expansion joints and bellows adaptations to piping installations. Dimensional drawings, tables, and related piping data are also included.—*MagniLastic Division, Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.*

Item 242

OCTOBER, 1949

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using item number at the end of each review. Print your name and address, mail to

Editor, HEATING AND VENTILATING
148 Lafayette Street, New York 13, N. Y.

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237	238	239	240	241	242		

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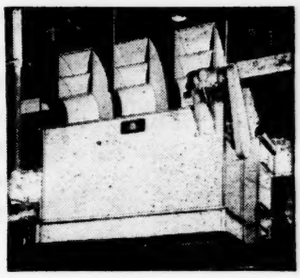
New HIGH PRESSURE STEAM Fan Heater Gives Savings You Never Had Before

The first heater to make High Pressure Steam really trouble-free and practical in plant heating. Every engineer should understand its original method; write for Niagara Bulletin and performance data.



HOW IT OPERATES: —

Dual coil system uses both sensible and latent heat. High pressure steam enters upper coil, shown on diagram below. Condensate drains into a trap. Then this high pressure condensate is released into the header of lower coil, instantly flashing into steam at vapor pressure.

Any high pressure condensate that remains liquid is carried to vapor condensate return header by drain tube that also gives off its heat into air stream.

Vapor condenses in lower coil. Its condensate is kept at a high level in return leg by a wier in the return header and sub-cooled by contact with coldest air entering heater. Vacuum condensate return to boiler is vapor free.

HOW IT SAVES IN COST: —

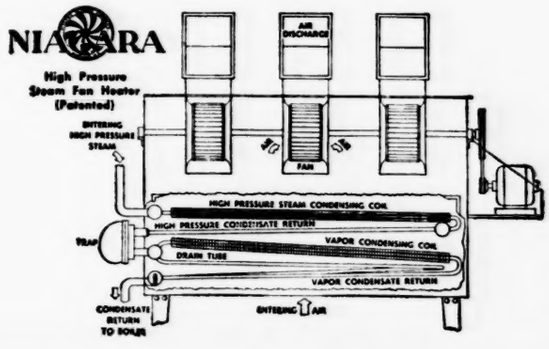
Piping is much smaller, simpler and less costly than in low pressure systems. Big traps and valves are not needed.

HOW IT SAVES IN OPERATION: —

Waste is prevented. Every BTU goes where you want it. No dump traps or hot wells waste live steam.

HOW IT SAVES IN UPKEEP: —

Condensate flow is even, vapor free, easily handled. No sudden surges of condensate in starting. No hammering, no hard wear and tear on system. Final air temperatures are not excessive; heat easily directed where needed; no flashing of low pressure condensate.



NIAGARA BLOWER COMPANY
Dept. HV
405 LEXINGTON AVE., NEW YORK 17, N. Y.

Please send Bulletin 109 on the Niagara High Pressure Steam Fan Heater.

Name .....

Address .....

Get ready for Winter!

INSTALL

TODD BURNERS

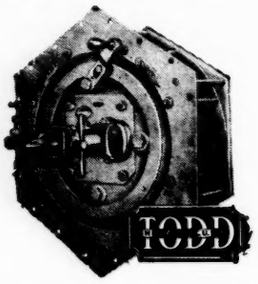
—GAS OR OIL

Don't let Winter unnecessarily increase your power costs. Have Todd burners—save up to 10% on your fuel and maintenance bills . . . get greater power capacity. Let skilled Todd specialists, backed by 35 years of Todd experience, engineer your boiler plant for utmost economy . . . replace your obsolete equipment . . . provide efficient new installations.

Oil Burners

Gas Burners

Combination Oil and Gas Burners



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Getting Personal

N. C. Curtin

Norman C. Curtin *(Selection of Anthracite Heating Equipment for Commercial and Industrial Buildings*, page 81) has been identified with the anthracite industry continuously since 1926. Following his graduation from Carnegie Tech with a degree of Bachelor of Science in Mechanical Engineering in 1924 he spent two years with the Bell Telephone Company of Pennsylvania and the American Blower Company at Detroit.

Since 1926 he has taken part in the anthracite industry's many merchandising and product utilization training programs for all branches of the industry. He served as field representative for the industry in Rochester, New York, until 1946 when he was appointed supervisor of field representatives for Anthracite Institute.

As a heating engineer in the field he has for 23 years had wide practical experience in combustion service for all sizes of heating plants. In various cities in the anthracite market area he has consulted on selection, operation and maintenance of heating and power plants in commercial installations.

P. A. Hyde

Percy A. Hyde *(Looping a System for Steam Distribution*, page 63), was born in Canada, and when one year old his parents moved to Kansas. His father was in the ministry, which possibly accounts for some of the yearly changes. The family located in Toulon, Illinois, where Mr. Hyde received a public school education and began his public utility work. At that time he was barely 16 years old. He remained in Toulon for 8 years, then joined the Illinois Light Company, being transferred to Springfield, Ohio, with the Ohio Edison Company, some three or four years later.

Mr. Hyde came to Akron from Springfield, Ohio, in 1927, to build the steam distribution system for the new Beech Street Steam Plant of the Ohio Edison Company. Following its completion he was placed in charge of maintenance of the system and also steam sales representative, positions which he still holds.

Mr. Hyde has been active in the National District Heating Association for a number of years, having served as a director since 1947, until elevated to third vice-president in 1949.

J. M. Calhoun

Dr. John M. Calhoun *(Air Conditioning in Storing and Handling Motion Picture Film*, page 66) is a member of the technical staff of the Eastman Kodak Co., in which capacity he has studied requirements of motion picture film and other photographic products over the past ten years. He has made many investigations into the necessity for air conditoning and temperature control for the handling and storage of film. He is the author of several technical articles on the physical characteristics of photographic products.

A native of Alberta, Canada, Dr. Calhoun attended the University of Alberta from which school he was awarded

LEE DIRECT WARM AIR HEATING

Higher Efficiency! Greater Economy!

Direct warm air heating is fundamentally the most efficient means of transferring heat from fuel to air, and is especially suited to the heating of industrial buildings of all types, hangars, etc. Lee Engineering Company was one of the pioneers in this field, and today offers a complete line of both central system heaters and unit heaters. The Lee system gives heat WHEN needed and WHERE needed. It begins to distribute heat immediately after fire is lighted and fan started, responds promptly without lag. Air-flow is counter-current to flow of combustion gases, so that air becomes warmer as it extracts heat from the progressively hotter gases. Lower installation cost than steam or hot water; requires no licensed attendant; provides ventilation without additional cost. No expensive installation or maintenance of pipes, traps, valves, and pumps. Used with oil or gas, also with coal (stoker or hand-fired). Four main types illustrated here—send for Bulletin 10 with complete facts.

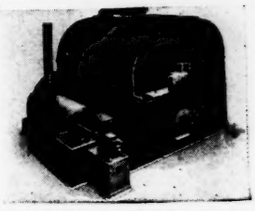
BRICK-SET TUBULAR HEATER

For use with central heating system (with duct distribution). Single heater capacities, 2,800,000 to 8,000,000 Btu per hour. Battery of two operating as unit, provide over 10,000,000 Btu per hour.

Brick Set Tubular Heater

STEEL ENCASED TUBULAR HEATER

For use with central heating system (with duct distribution). Capacity range, 2,000,000 to 6,000,000 Btu per hour. May be installed in heated area without enclosure, requires no foundation. Unit may be moved by taking apart and reassembling.



Steel Encased Tubular Heater

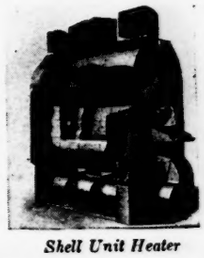
TUBULAR UNIT HEATER

For use as central system (with duct distribution) or as unit heater, with adjustable outlet nozzles. Capacity range, 2,000,000 to 6,000,000 Btu per hour. In sizes up to 4,000,000 Btu, shipped completely assembled with all but mechanical equipment, refractory lining and controls in place. Requires no foundation. Equipped with crane hooks for moving.

Tubular Unit Heater

SHELL UNIT HEATER

For use with or without distributing duct system. Capacity range, 300,000 to 2,000,000 Btu per hour. Both hand and stoker-fired models. All units shipped completely assembled, wired, ready for operation. Units furnished with either refractory lined or stainless steel combustion chambers. Heaters may be floor mounted or suspended in any position.



Shell Unit Heater

LEE ENGINEERING COMPANY

95 RIVER STREET • HOBOKEN, NEW JERSEY

(Formerly Youngstown, Ohio)

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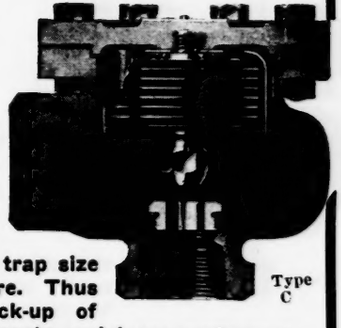
THE ACKNOWLEDGED STANDARD IN AUTOMATIC PRESSURE, TEMPERATURE, LEVEL AND FLOW CONTROL UNITS
Here are a few of an outstanding line of Controls for Industrial, Commercial and Domestic applications.
★ALL-GAS CONTROLS
★AIRCRAFT CONTROLS, ELECTRIC
★AUTOMATIC SAFETY PILOTS
★GAS REGULATORS
★LOW WATER CONTROLS
★GOVERNOR TYPE VALVES
★HI-LOW-OFF VALVES
★INDUSTRIAL VALVES
★LOW PRESSURE GAS VALVES
★MOTOR OPERATED VALVES
★MAGNETIC GAS VALVES
★PILOT BURNERS
★PILOT GENERATORS
★REFRIGERATION VALVES
★SOLENOID VALVES
★STRAINERS—RELAYS
★GAS COCK SAFETY VALVES
★THERMOSTATIC CONTROLS
★TRANSFORMERS—SWITCHES
★THERMOPILOTS
Controls for air, water, steam, natural, manufactured and liquefied petroleum gases, light and heavy oils, etc., refrigerants such as freon, methyl chloride, sulphur dioxide and ammonia.
A. C. or D.C., normally closed or open types. High and low pressures and temperatures. PROVED AND IMPROVED PERFORMANCE IS PROOF THAT YOU CAN'T BUY BETTER CONTROLS
GENERAL CONTROLS
FACTORY BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES
FOR COMPLETE SPECIFICATIONS REQUEST NEW CATALOG.

Nicholson Steam Traps

STOP BACK-UP of CONDENSATE

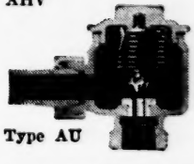
Operate on Lowest Temperature Differential



Type C

Repeated comparative tests by large users of traps show that Nicholson traps operate on lowest temperature differential: 5° to 15°, depending on trap size and pressure. Thus prevent back-up of condensate and keep equipment full of live steam. Installations have increased production of cooking kettles, for example, as much as 30%. Widely specified for preventing damage to thin gauges. Eliminate "cold blow" in unit heaters. Size ¼" to 2"; pressure to 225 lbs.

Type AHV



Type AU

BULLETIN 1047

W. H. NICHOLSON & CO. 199 OREGON STREET WILKES-BARRE, PA.

Valves ★ Traps ★ Steam Specialties

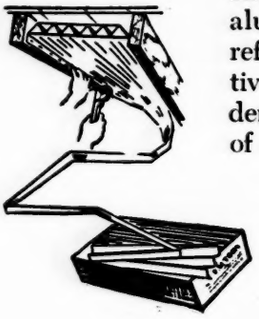
INFRA Insulation Pleases the Professors

Infra Insulation has had remarkably wide use in buildings of a long list of Colleges, Universities and Engineering Schools. They have access on their own campuses to the finest scientific talent, make thorough tests, base their selection on searching, impartial appraisal.

In college after college, in test after test, Infra is selected—because Infra's superior insulating values are so quickly and decisively established.

JUST A FEW COLLEGES WHICH HAVE USED INFRA

Bowdoin College, Brunswick, Maine
Colby College, Waterville, Maine
Culver Military Academy, Culver, Ind.
Harvard University, Cambridge, Mass.
Massachusetts Inst. of Technology
Michigan State, Traverse, Mich.
Princeton University, Princeton, N. J.
Purdue University, Purdue, Ind.
Wells College, Aurora, N. Y.



Infra's multiple separated aluminum sheets provide 4 reflective spaces and 4 reflective surfaces, each non-condensation-forming. Two sheets of aluminum and the accordion partition block convection currents. Infra's triangular reflective air spaces and small mass eliminate conduction as a problem.

INFRA C FACTORS AND ROCKWOOL EQUIVALENTS

C.052 Heat Flow Down, equals 6" Rockwool.
C.093 Heat Flow Up, equals 3½" Rockwool.
C.10 Lateral Heat, equals 3 1/3" Rockwool.
Thermal Factors Printed on Every Infra Carton

WRITE Infra for details and FREE COPY of "Bulletin No. 38," issued by the National Housing Agency of the Government, reporting tests of Aluminum Insulation made by the U. S. Bureau of Standards, and dealing principally with the problems of heat transfer and condensation.

***Address Dept.* HV**

MULTIPLE ACCORDION ALUMINUM & TRIANGULAR REFLECTIVE AIR CELLS

Infra INSULATION, INC.
10 Murray St., N. Y., N. Y.

the Degree of Bachelor of Science in 1935. He then attended the Graduate Schcol of McGill University and in 1938 received his Ph.D., in Physical Chemistry. It was after completion of his graduate study that he began employment with the Eastman Kodak Company.

J. R. Brannan (co-author, *Compensations Affecting Heat Transmission in a Flue or Tube*, page 70) was born in Georgia. He entered the fuel oil and oil burner business in 1926, associated with Petroleum Heat & Power Co. During World War II he served with the Petroleum Administration and following the war, he was employed by Meenan Oil Co.

J. R. Brannan

C. H. Burkhardt

Charles H. Burkhardt (co-author, *Compensations Affecting Heat Transmission in a Flue or Tube*, page 70) received his B.S. from St. Johns University, Brooklyn, N. Y., in 1938, and he did postgraduate work in the fields of combustion and refrigeration in the School of Science and Technology, Pratt Institute.

During the war he served as an officer in the Transportation Corps, and upon leaving the service became associated with the heating department of a New York City trade school. From 1948 to 1949 he taught heating at the Walter Hervey Junior College. He also conducted oil-burning research projects for industry. At present, he is director of field education, Perfex Corp., Milwaukee, Wis.

Mr. Burkhardt has contributed many technical articles to plumbing and heating publications and is completing a book on the Principles of Automatic Oil Heating.

. . . Since the Last Issue

Roger H. Dowling has been appointed general service manager of **York Corp.** Mr. Dowling came to the York organization from Virginia Polytechnic Institute in 1928, when he entered the York student training course. In 1938, Mr. Dowling was named manager of the newly-formed sales engineering department, and in 1943 became assistant sales manager in charge of all engineering and pricing phases of sales department operations.

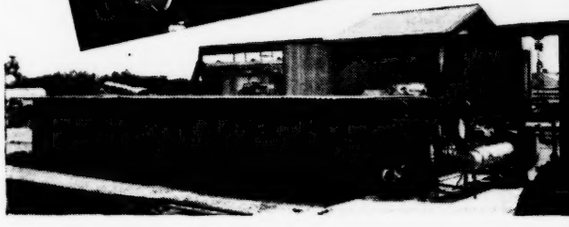
Hendley Blackmon, managing editor of *Electrical World* since 1947, has been appointed assistant manager of engineering association activities for **Westinghouse Electric Corp.** He will work with Westinghouse engineers in the preparation of papers to be presented before engineering associations. Following his graduation from Georgia School of Technology in 1925 with a B.S. degree in electrical engineering, Mr. Blackmon spent a year on the Westinghouse student course. Upon completion of this orientation training, he worked in various engineering departments and in 1932 was named technical editor of the company's technical press bureau. He was appointed manager in 1938, a position he held until 1945 when he resigned to join McGraw-Hill Publishing Co.

Bryant Industrial

COIL CAGE BURNERS FOR
IMMERSION FIRING

ENGINEERED FOR SIMPLE AND CORRECT BURNER APPLICATION

Complete assemblies for gas-firing immersed tubes for heating water, solutions, oils and other liquids, and certain low-temperature soft metals and salts. Easily mounted on tank or coil by lugs or setscrews with burner held securely in place. 15,000 to 1,200,000 Btu per hour inputs. Available with a wide variety of Bryant ignition and piloting devices for various types of applications. (*Write for Data Sheet 1C-1*)



BRYANT INDUSTRIAL DIVISION
Affiliated Gas Equipment, Inc.
1020 LONDON ROAD • CLEVELAND 10, OHIO

ALBANY HOUSES, TOO.

This is the eleventh of New York City's huge housing projects to select

THERM-O-TILE
Reg. U. S. Pat. Off.

Underground Steam Conduit . . .

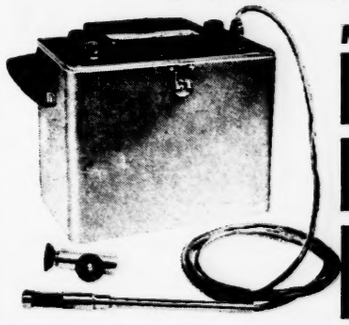
The preceding ten were named in advertisements in this magazine during the past year. See, particularly, the ad in the January issue of Heating, Piping and Air Conditioning which tells about the largest of its kind. Bulletin 381 shows and tells WHY Therm-O-Tile is chosen when superior performance is needed. Ask for a copy.

Stronger. More efficient. More economical because its ultimate cost is lowest. And in addition, even its FIRST COST is competitive.

Sold and installed by Johns-Manville Construction Units in all Principal Cities.

H. W. PORTER & CO., Inc.
823-V Frelinghuysen Ave. Newark 5, N. J.

ANEMOTHERM
AIR METER



MEASURES

AIR VELOCITY
FROM 10FPM to 6,000FPM

AIR TEMPERATURE
FROM 30F to 155F

STATIC PRESSURE
FROM 0 TO 4 NEG. AND FROM 0 TO 10 POS. IN. WG

This precision instrument gives vital data on the performance and efficiency of heating, ventilating and air conditioning systems. Direct, instantaneous readings.

SEND FOR FREE 4-PAGE FOLDER

Anemostat Corporation of America, Dept. TH-14
10 East 39 Street, New York 16, N. Y.

☐ Please send new 4-page folder on the Anemotherm Air Meter.
☐ I would like to have the Anemotherm demonstrated.

Name .....
Company .....
Address .....

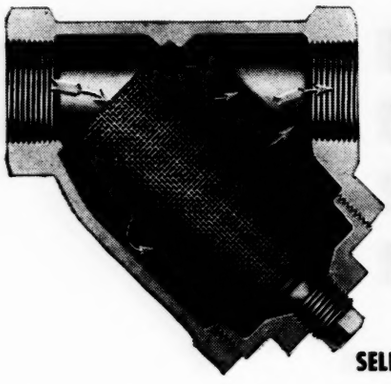
AC 1251

McALEAR

DEPENDABLE PRESSURE REGULATION

McALEAR NO. 175
PRESSURE REDUCING REGULATOR

Here's accurate, dependable regulation for any application involving reduced pressures in the range from partial vacuum to 15 pounds per square inch gauge pressure. Double seated construction gives sensitive control. Other valves can be furnished with single seated construction or with spring adjustment in place of lever and weight for higher pressures. Sizes range from ½" to 20". Write for bulletin No. 119.



DEPENDABLE PIPING SYSTEM PROTECTION

McALEAR NO. 530
SELF-CLEANING "Y" STRAINER

Protection of pumps, valves, meters and other equipment calls for strainers wherever danger exists from sand, scale or pipe cuttings. Available in *any* size and *any* material . . . in either "Y" or basket type . . . McAlear strainers mean longer life for expensive equipment, fewer shut-downs and fewer repairs. Ask for bulletin No. 128.

McALEAR Mfg. Co.
1913 SOUTH WESTERN AVENUE
CHICAGO 8, ILLINOIS

McALEAR controls
for STEAM, WATER, AIR, OIL-GAS

REPRESENTATIVES IN PRINCIPAL CITIES

AN INDEPENDENT MANUFACTURER FOR OVER 40 YEARS

Binks Mfg. Co. announces the opening of a sales and engineering office located in the Empire State Building, New York, with **E. J. Cremer** as manager.

Ben M. McDougall has joined **Kennard Corp.** as assistant sales manager. An engineering graduate of Southwestern Louisiana Institute and charter member of New Orleans A.S.R.E. Section, Mr. McDougall served as laboratory test engineer and sales representative of Alco in the southeast area and more recently as manager of Crown Insulation Co., Columbia, South Carolina.

W. P. Jones

The board of directors of **Servel, Inc.**, has elevated **Louis Ruthenburg** to the newly-created post of chairman of the board and chief executive officer in recognition of his important contributions to the company's development since he became president in 1934. Upon Mr. Ruthenburg's nomination, the Servel board named as president, general manager and director **W. Paul Jones**, who has been in the refrigeration industry 28 years and who at one time had been advertising and sales promotion manager of Servel. Mr. Jones resigned as vice president and director of Philco Corp., in charge of the refrigerator division, to accept the post. He was elected president of Philco Refrigerator Co. in 1938. When Philco Corp. was formed in 1940 he was named vice president and director, in charge of the refrigerator division. Earlier he had been executive vice president of Fairbanks-Morse Home Appliances, and before that president and general manager of Refrigeration Products Co., Evansville, Ind. From 1929 to 1933 he was advertising and sales promotion manager of Servel, Inc., after which, for two years, he was assistant general manager of the commercial division of the company. Born in Winslow, Ind., in 1901, Mr. Jones was educated at Oakland City College, Indiana. His headquarters will be in Evansville.

Modine Manufacturing Co. announces the appointment of new sales representatives for its Los Angeles, Dallas and South African territories. In the Los Angeles territory, **T. R. McGovern** has been appointed to handle the complete line of the company's heating and ventilating products. **J. R. Dowdell & Co.**, 402 Swiss Ave., Dallas, has been appointed to represent Modine in the Dallas, Texas, territory. The company will handle Modine unit heaters, convectors and coils. **The Safex Engineering Co. (Pty.) Ltd.**, 3 Harrison St. S., Johannesburg, South Africa, has been appointed to represent Modine in the Union of South Africa and the Rhodesias.

Guy A. Voorhees, application engineering director of the **National Warm Air Heating and Air Conditioning Association**, has recently been assigned the additional duty of technical secretary.

Stan P. Schrameck has been appointed manager of marketing personnel and sales training of the **General Electric Co.'s** air conditioning department. Prior to his appointment he was a management-consultant specialist in sales training with X. F. Sutton Associates, New York, serving national organizations in their personnel development programs.

Roy H. Stearns has been appointed manager of builder sales of the automatic heating division of G.E.'s air conditioning department. Prior to his appointment, Mr. Stearns was builder sales representative in the northern New Jersey areas.

G. W. Hart has been appointed manager of market research of General Electric's air conditioning department. Prior to his appointment he was manager of sales forecasting and scheduling. From 1948 to March 1949, he was assistant to the marketing manager.

John R. Gowell has been appointed manager of sales forecasting for the air conditioning department. Prior to his appointment he was an engineer with the management-consultant firm of Booz, Allen and Hamilton, New York.

SEE—
for yourself

How a fast-running repair job is done in an old hotel

You can do *more work* every day when you bend pipe with a

TAL *Portable* Bender

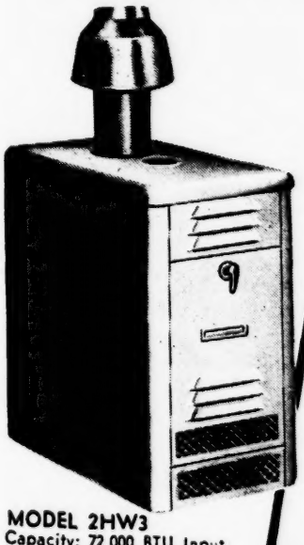
Work goes faster when you bend on the job — either original installation, radiant heat or repair. Fewer joints to leak in the future, less friction, more satisfaction for your customers and a bigger profit for you. Do as hundreds everywhere are already doing. Write for illustrated data bulletin. Dept. 12.

Tal Bender, Inc. Milwaukee 2, Wisconsin

GAS HEATING EXPERTS SELECT . . .

HYDROTHERM

FOR RADIANT & CONVECTOR SYSTEMS.



MODEL 2HW3
Capacity: 72,000 BTU Input
Size: 13"x26"x26"
Weight: 250 lbs.

Exclusive Cast-Iron Design Assures Maximum Performance at Lowest Cost in Minimum Space

AGA Approved for All Gases
100 lbs. A.S.M.E. Rating

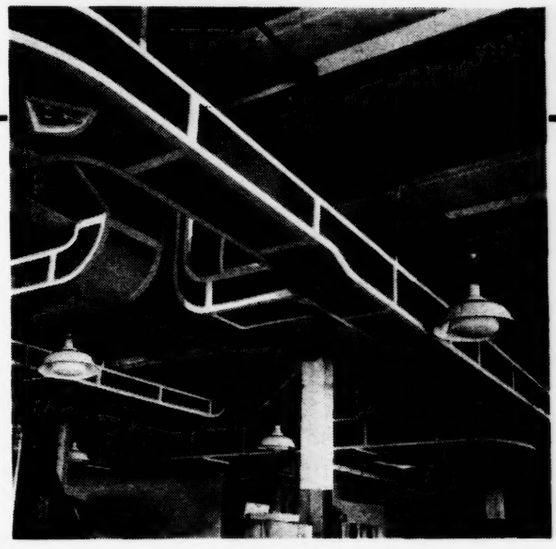
Write For HYDRO THERM Bulletin

HOOK & ACKERMAN, Inc.
18 East 41st Street, New York 17, N. Y.

CUT LABOR COSTS

WITH ASBESTOS-PROTECTED

DUX-SULATION



AND GAIN *Nine* IMPORTANT PERFORMANCE ADVANTAGES!

It isn't often that you find a product that reduces labor costs, and yet offers marked advantages over slower, costlier methods!

That's exactly what you'll get when you insulate your duct-work with asbestos-protected DUX-SULATION. No screws, wires, lugs or bolts are needed. Every roll comes complete with a special adhesive and asbestos-protected tape for covering the corners and joints. Rolls are easy to stock and handle, being 36" wide, ½" and 1" thick, and containing 100 square feet.

In addition to its cost-saving, DUX-SULATION gives "nine lives" of service: not only does it save fuel, but it prevents metallic noise, helps system-balance, and offsets overloads, reduces the power load, prevents condensation, prevents rust, absorbs sound and reduces vibration. You'll notice, too, how it improves the appearance of the duct system.

You can apply it to either the inside or the outside of round, rectangular, or irregular shaped ducts and fittings. It won't crack, chip, or buckle, and its unique flexible construction makes it superior for all types of warm air heating, air conditioning and ventilating duct work.

Ask your jobber today about asbestos-protected DUX-SULATION.

Check your duct systems now — insulate them with DUX-SULATION and gain these cost-saving and performance benefits now—and for years to come!

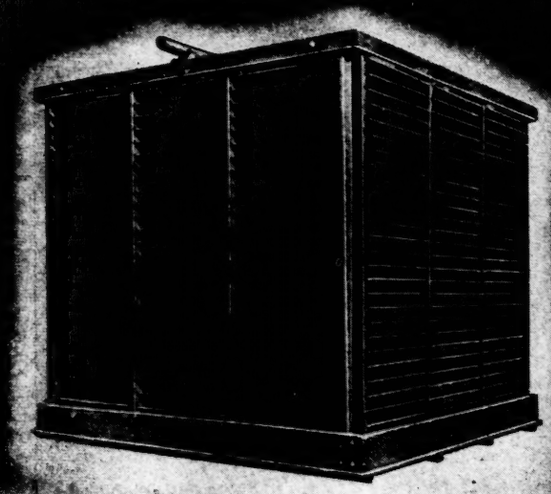
★ ★ **WRITE FOR BULLETIN NO. 410-HV** ★ ★

GRANT WILSON, INC.

22nd FLOOR, BOARD OF TRADE BUILDING

LA SALLE AT JACKSON BLVD. • CHICAGO 4, ILL.

SPECIFY MARLEY
Series 200
FOR AN
ENGINEERED SPRAY TOWER



If you need a cooling tower that

May be expanded at any time
Is pre-fabricated for easy erection
Can be erected by semi-skilled labor
Has complete Erection, Operation and Maintenance Instructions
Is assembled with heavy galvanized bolts
Is made of Heart Quality Redwood
Has double vertical columns
Is designed to withstand 100 mph wind
Has slip-fit louvers
Has complete basin with sump and automatic valve
Is designed with a balanced spray system
Has patented Marley Spray Nozzles
Will give long trouble-free service
Has Atmospheric Sections as optional equipment
Can be installed in an open location

YOUR BEST BUY is a MARLEY SERIES 200

Series 200 atmospheric spray towers are designed to meet the requirements of dairies, locker plants, air conditioning and thousands of other applications where low first cost is a "must."

By installing standard Atmospheric Sections in a Series 200 Cooling Tower various fluids may be cooled indirectly. Series 200 Coil Towers are especially desirable for Engine Jacket Cooling, Diesel Engine Cooling, Quench Oil Cooling, and for many other similar applications.

Ask for a MARLEY Factory-Trained APPLICATION ENGINEER to tell you how the SERIES 200 will help solve your air conditioning and water cooling problems. No cost or obligation.

MARLEY COOLING TOWERS

THE MARLEY COMPANY, INC.
Kansas City 15, Kansas

Thomas R. Byrley has been named manager, Comfort Ray Radiant Baseboard Division, by the **United States Radiator Corp.** Mr. Byrley had been with A. P. Woodson Co., heating engineers and contractors, Washington, D. C., since 1936. He is the author of a boiler rating manual, and has written numerous technical magazine articles.

S. E. Wolkenheim

Stanley E. Wolkenheim has been named sales supervisor of the three lines of electric water heaters manufactured by the **A. O. Smith Corp.** Mr. Wolkenheim comes to A. O. Smith from Hotpoint, Inc., an affiliate of the General Electric Co. Mr. Wolkenheim served as sales manager of Hotpoint's water heater division, with headquarters in Chicago. He was then made full manager of the water heater division and shortly after was given the additional responsibility of the company's range division. In his new position, Mr. Wolkenheim will supervise national distribution of the A. O. Smith line of electric water heaters. Mr. Wolkenheim will make his headquarters in Kankakee, Illinois.

Warren Webster & Co. is now represented in Richmond and in all counties in the State of Virginia with the exception of those counties served by its Washington representative by **L. A. Bernert,** Crenshaw Building, 300 East Main Street, Richmond 19, Va. Mr. Bernert has worked as a Webster sales engineer and representative for more than twelve years.

American Blower Corp., Detroit, Mich., has announced that negotiations have been completed for a new manufacturing and assembly plant to be located at San Leandro, Calif. Plans call for the erection of a single masonry and steel building, covering 40,000 sq ft, to be ready for operations sometime in January, 1950. The corporation has purchased 10 acres of ground to provide for future expansion. Contract for the first unit has already been awarded to the Austin Co., architects and builders.

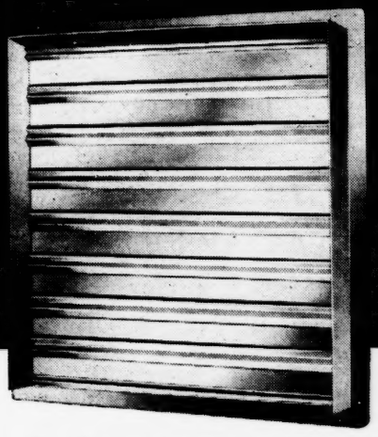
Marlo Coil Co. of St. Louis has announced the purchase of additional land for expansion purposes. Adjacent to the present Marlo plant site, the new addition will give the company an entire city block. One-half acre of the new area will be devoted to increased production facilities, and another one-half acre will be used for added warehousing space.

L. W. Clarke

L. W. Clarke, vice president in charge of sales, the **Philip Carey Mfg. Co.,** Cincinnati, Ohio, was elected a director of Carey at its board of directors regular quarterly meeting. Mr. Clarke is a 1913 graduate of the United States Naval Academy. He served as a line officer in the U. S. Navy until late 1919 when he resigned to accept the position of assistant superintending engineer of the New York and Cuba Mail Steamship Co. From 1924 to 1935 he served first as an engineer and later as sales manager for the Robert A. Keasbey Co. He left Keasbey to join Carey as insulation department manager in the company's New York office, becoming New York district manager in 1937. In 1946 he was appointed general sales manager and early this year was elevated to his present position.

A. E. Hess has announced his resignation as managing director of the **Oil-Heat Institute of America** effective October 1. He will join the marketing and distribution division of the Lustron Corp., Columbus, Ohio, immediately in an executive capacity.

they all want AIR-FLO



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

Front View—Closed

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

Write for New Air-Flo Catalog 43-F

Illustrations and details of the complete Air-Flo line.

AIR CONDITIONING PRODUCTS CO.

2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

• **The very smallness of the Skidmore Vertical Type "CV" Condensate Pump and Receiver makes it ideal where space is limited. Yet, the Vertical Type "CV" Pump affords big performance with a wide range of selectivity. Ideal for condensate returns from all types steam heating and process equipment — centrifugal type — maintained efficiency.**

Capacities ranging from 500 to 10,000 sq. ft. E.D.R. Discharge pressures from 10 to 20 pounds. Write today for full particulars and for Bulletin No. 21, Dept. HV.

SKIDMORE PUMPS

ST. JOSEPH, MICHIGAN

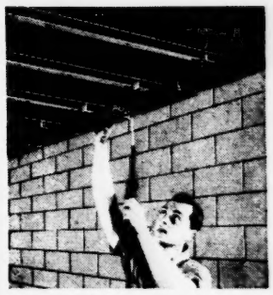
INVISIBLE RADIANT HEATING

KRITZER "FIN-TUBE" RADIANT COILS

for the NEW economical RADIANT HEATING!

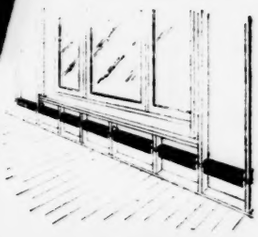
Thousands of installations have now proved the amazing advantages of Kritzer Radiant Coils from the important standpoint of heat transfer and especially the practical economy of both materials and labor. For better installations, for more profits, GET THE FACTS!

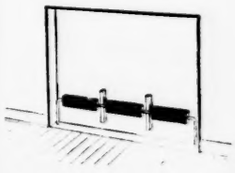
FOR JOISTS AND STUDS 12"—16" OR 24" O.C.



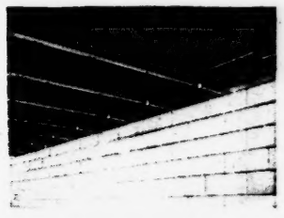
Joining coil sections with torch and solder ring. No threading. No fitting.

"Fin-Tube" panel heating in picture window wall.





Kritzer Radiant Coils in recessed chamber for panel heating.



A finished heating section on Kritzer hangers. Joists furred and ready for lath and plaster.

CONVENIENT LENGTHS

SIMPLE • TIME-SAVING DOLLAR-SAVING

A single Kritzer Radiant Coil supplants several lengths of ordinary tubing. These coils are a single ⅝" copper tube with mechanically bonded 1½" x 3" aluminum fins, ¼" apart. Here is efficient heat transfer with first cost the last cost. WRITE TODAY and send the coupon.

IF IT'S KRITZER, IT'S RIGHT SIR

NEW DESCRIPTIVE FOLDER AVAILABLE

KRITZER RADIANT COILS, INC.
2907 West Lawrence Avenue, Chicago 25, Illinois

Gentlemen: I'm interested. Please send complete information and bulletin on KRITZER "Fin-Tube" Radiant Coils.

Name_____

Firm_____

Address_____

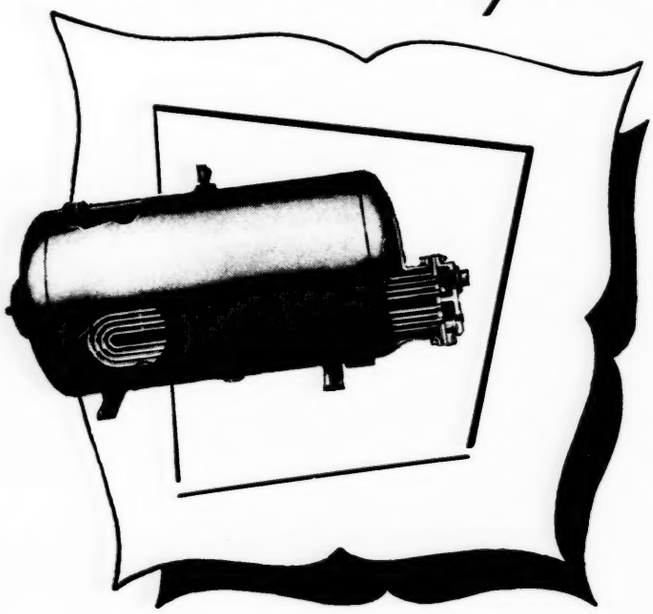
City_____ Zone_____ State_____

Patterson "copper lined"

hot water storage heaters

supply

New York's finest



EMPIRE STATE BUILDING
ROCKEFELLER CENTER
UNITED NATIONS
WALDORF ASTORIA HOTEL
COLUMBIA PRESBYTERIAN MEDICAL CENTER
N. Y. HOSPITAL — CORNELL MEDICAL CENTER

Copper lined, to assure clean, rust-free water economically; storage heater type, to provide better heat balance and utilization of waste condensate heat; Patterson, to be sure of the best in both design and construction... What has been done and is being done in New York's finest buildings is duplicated in other great cities. There must be something out of the ordinary about Patterson "Copper Lined" Hot Water Storage Heaters that makes architects and owners prefer them and plumbing and heating contractors buy them.

New Copper Lined Storage Heater Catalog available upon request.

the **Patterson-Kelley Co., Inc.**

94 Burson Street • East Stroudsburg, Pa.

offices or representatives in principal cities

Jas. P. Marsh Corp. of Skokie, Illinois, has announced the purchase of the Electrimatic Valve Division of Simoniz Co. of Chicago. All Electrimatic valves will now be manufactured and distributed by the Marsh Corp. through Electrimatic Division of Jas. P. Marsh Corp., at Skokie. Sales will be handled entirely by Marsh representatives.

Frederic I. Lackens, for twelve years advertising manager of **The Hays Corp.,** Michigan City, Ind., is retiring from that position. He will be succeeded by **Phil Sprague, Jr.** Mr. Sprague received his BA degree from Beloit College in 1946 and his MBA degree from Harvard Business School in 1948. For the past year he served on the staff of the Business School, acting as research assistant to Neil H. Borden, professor of advertising.

Harry W. Terry, consulting engineer of Scarsdale, New York, has opened a New York City headquarters at 518 Fifth Ave., New York. Mr. Terry graduated from Syracuse University with the degree of Mechanical Engineer and later pursued studies in sanitary and industrial analysis of water at the University of Minnesota and business administration at New York University. He is the designer of mechanical, electrical and sanitary equipment for buildings for many of the country's renowned architects, including the architects for the Grand Central Station, New York City, having been successively located in St. Paul, Minneapolis, Chicago and New York.

Three closed plants of the **American Radiator & Standard Sanitary Corp.** have been reopened. The plants are located at Baltimore, Bayonne, N. J., and Buffalo. No action was taken on the Pittsburgh plant, which has been closed since April 28.

Bryant Heater Division has announced the appointment of **R. C. Anderson** as the Bryant distributor for the Houston territory. Mr. Anderson's organization, the Bryant Anderson Co. will be located at 3215 Locke Lane, Houston, Texas.

Edward S. Steigner, a member of **The Youngstown Sheet and Tube Co.'s** metallurgical department for 15 years, has been appointed tubular products development engineer. He will be associated with Karl L. Fetters, special metallurgical engineer. **Darwin E. Hachat,** former general foreman of the power division, has been promoted to superintendent of power at the Indiana Harbor plant of The Youngstown Sheet and Tube Co. He has been with the company 20 years.

Henry Valve Co., Melrose Park, Ill., a suburb of Chicago, announces the appointment of **Raymond J. McCahill** as field engineer for southern Illinois, Indiana, Missouri and Kansas.

Research Corp. announces that the **Niagara Blower Co.** has been awarded a license to manufacture dehumidifying and air conditioning equipment under its series of patents covering the removal of moisture from air or other gases by the use of a hygroscopic liquid. The dehumidifying liquid, as it is diluted by the airborne moisture, is automatically reconcentrated in apparatus which evaporates the moisture and discharges it outdoors. New equipment to make the liquid absorbent dehumidifying method commercially available is now being designed.

Plans for the consolidation of all manufacturing facilities of the **Baker Refrigeration Corp.** at its eastern division, located at South Windham, Maine, have been announced. Negotiations have been completed for approximately 35,000 sq ft of additional manufacturing floor space, where compressors and condensing units will be machined, assembled, tested and shipped.

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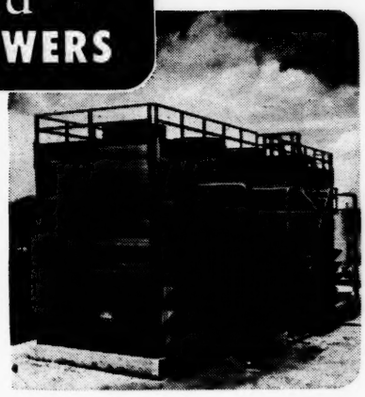

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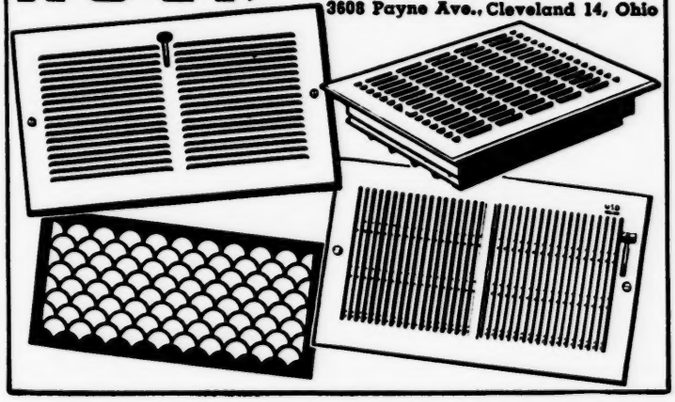

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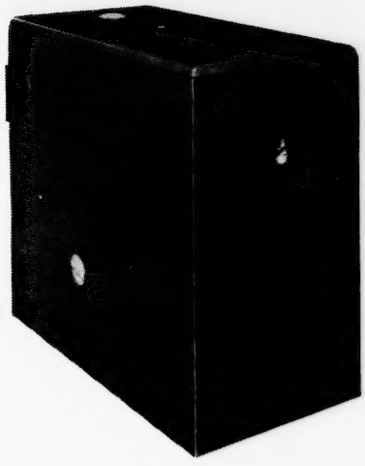

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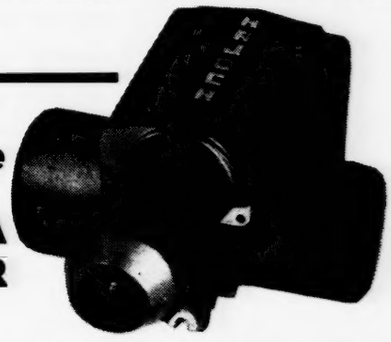

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UNDERWRITERS' APPROVED

ONE CHIMNEY FOR TWO HEATERS

(Concluded from page 91)

maintain a heated chimney past the flue opening from the water heater. Should it not do so when off, a most likely thing with an outside chimney, then any cold air coming down the chimney will settle below the upper opening and thereby not affect the flow from this opening. In any event, a higher flue connection always gives the better draft, and when it is the smallest sized one, it acts as less of a draft check on the other device.

An arrangement less to be preferred, though sometimes approved, is shown in the sketch on page 91. Here a wye fitting in the combined flue may serve to give some slight pull on the gas water heater, but the main idea is to ease the flow from the heater to its mixture with main flue gases. If a bullhead tee were substituted for the wye, gas flow from the big boiler would block the flow from the small water heater.

The writer's objections to this last arrangement is the possibility of down-drafts in the wye affecting the down-draft diverter on the heater by giving a one-sided back flow through it. One other objection is the locating of any gas-fired device so far from the chimney as would be the larger boiler in the case shown. Maximum allowable length with gas fuel depends upon the temperature and quality of flue gas and the available draft. Generally speaking, a gas flue is safe up to 20 ft of horizontal direct run; the shorter the flue, the less friction cooling and leakage in the flue. Flues necessarily long should be made one size larger and well insulated. They should never be less in size than the flue connection on the device, nor have an area less than the aggregate areas of vent outlets on appliances. Flues should be pitched upward one-quarter inch to the foot.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

WELDING AND METAL MEETING—30th annual meeting of the American Welding Society, in conjunction with the National Metal Congress, at Cleveland Hotel, Cleveland, Ohio. Secretary of Society, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 16-21, 1949.**

AGA CONVENTION—1949 annual convention, American Gas Association, at Chicago, Ill. For details, contact secretary, AGA, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 17-20, 1949.**

ELECTRICAL ENGINEERS MEETING—Fall general meeting of the American Institute of Electrical Engineers, Netherland Plaza Hotel, Cincinnati, Ohio. Secretary of Institute, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 17-21, 1949.**

METAL EXPOSITION—31st national metal exposition, in conjunction with the National Metal Congress, at Cleveland Public Auditorium, Cleveland, Ohio, sponsored by American Society for Metals. W. H. Eisenman, managing director, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **OCTOBER 17-21, 1949.**

PUBLIC HEALTH MEETING—77th annual meeting of the American Public Health Association, and meetings of related organizations, at the Hotels Statler and New Yorker, New York City. Dr. Reginald M. Atwater, executive secretary of the Association, 1790 Broadway, New York, N. Y. ..... **OCTOBER 24-28, 1949.**

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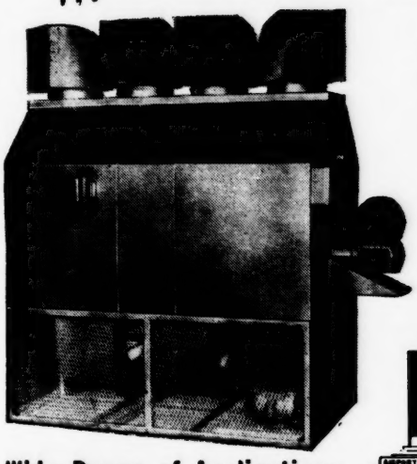

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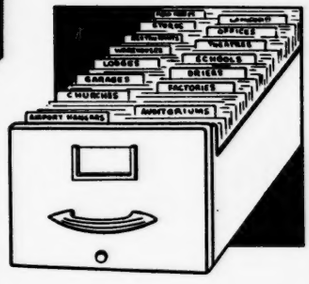

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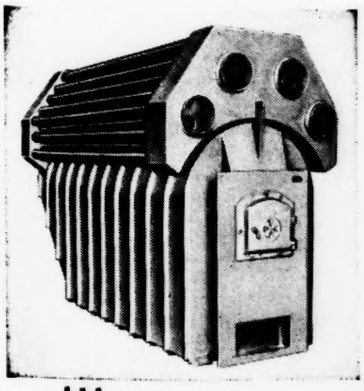
GENERAL CAPACITY DATA

Model Number	Btu	Cfm	hp	Dimensions (inches) length-width-height			Approximate Shipping Wt., Lbs.
T.D.— 25	250 000	3,600	¾	60	32	81	1,300
T.D.— 40	400.000	5,400	1	60	32	81	1,350
T.D.— 50	500,000	6,600	1½	80	32	81	1,780
T.D.— 70	750,000	8,800	2	80	32	81	1,855
T.D.— 80	800,000	10,200	3	80	48	81	2,110
T.D.—100	1,000,000	12,500	5	80	48	81	2,200
T.D.—125	1,250.000	15,300	5	100	54	103	3,000
T.D.—150	1,500,000	19.400	7½	100	54	103	3,250

NATIONAL HEATER COAL FIRED FORCED AIR UNIT



Specifically constructed and designed for stoker and hand firing with blower position at rear of casing, this unit embodies all the features of other NATIONAL heaters for greater satisfaction and economy of operation. Can be quickly and efficiently converted to light oil, heavy oil or gas firing as future fuel costs and supplies may necessitate.

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